Vol. 162 No. 4 21 March 1958

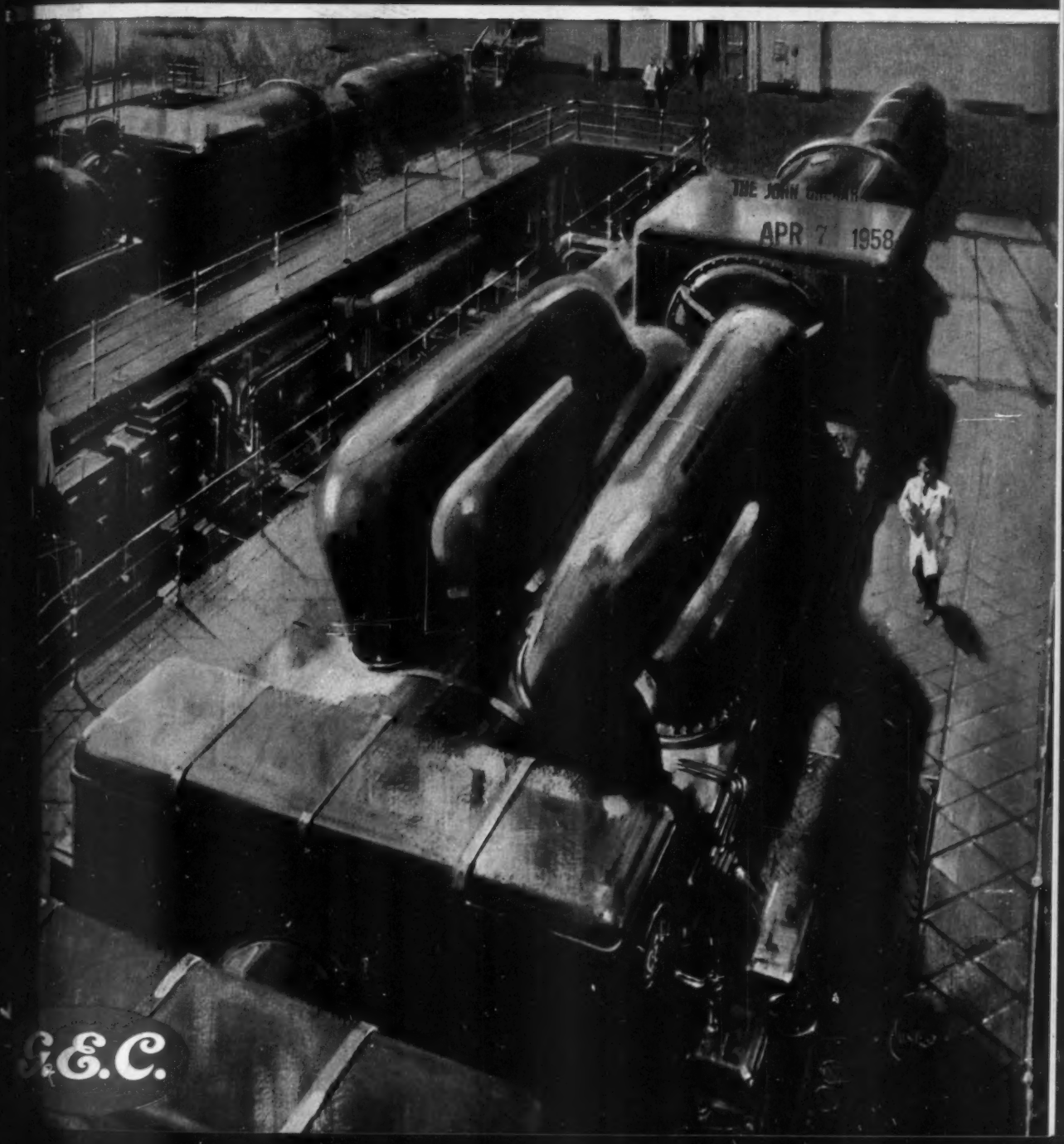
ELECTRICAL ENGINEERS EXHIBITION GUIDE

# ELECTRICAL REVIEW

621.3

21 MARCH 1958

PRICE 1s 6d



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But the core of a cable
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So we start with
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*Manufacturers of: Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Electric Fires, Food Trolleys, Warming Plates, Air Heaters, etc.*

A

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EARLS COURT - MARCH 25–29th 1958

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SEE THIS NEW RANGE AT
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ON STAND No. M.8

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## ELECTRICAL ENGINEERS EXHIBITION EARLS COURT

## MARCH 25TH-29TH

WHATEVER ELSE YOU SEE at The Electrical Engineers Exhibition make certain you call at Stand No. E.6. That's the MEM stand where their comprehensive range of equipment is on show.

Here you can talk with experts and inspect the full range of MEM Switch and fusegear, Motor Control Gear and Accessories and the enlarged range of heating appliances.

Make Stand No. E.6 at the front of the main gangway your first call.

**THE FOLLOWING MEMBERS OF MEM WILL ATTEND:-**

**For the whole week**

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G. GROVE *London Manager*
J. G. DAVIS *Export Manager*
G. A. RUFF *Sales Manager (Accessories)*
S. GEE *Technical Liaison Representative*
J. CHAPPELL, J. FALLON, H. W. ROBINSON, A. DYSON — *London and Home Counties Representatives*

**Tuesday March 25th**

S. D. GUNN *South Midlands Representative*
W. F. CARTWRIGHT *Southern Counties Representative*
A. LOAT *West Lancs. Representative*
T. SMITH *South Wales Representative*
M. J. FOSTER *Representative for Scotland (Part)*
J. ROE *East Midlands Representative*

**Wednesday March 26th**

S. D. GUNN *South Midlands Representative*
W. F. CARTWRIGHT *Southern Counties Representative*
A. LOAT *West Lancs. Representative*
T. SMITH *South Wales Representative*
A. M. PERKS *West of England Representative*
F. E. KNIGHT *North Midlands Representative*
M. J. FOSTER *Representative for Scotland (Part)*
J. G. WRIGHT *North England Representative*
J. ROE *East Midlands Representative*

**Thursday March 27th**

A. M. PERKS *West of England Representative*
F. E. KNIGHT *North Midlands Representative*
L. PIPER *Representative for Scotland*
J. G. WATERHOUSE *E. Lancs. & N. Wales Representative*
J. G. WRIGHT *North England Representative*
D. HASKELL *Southern Counties Representative (S.E.)*
W. BYWATER *Eastern Counties Representative*
A. D. BAKER *Yorks. and N. Lincs. Representative*
S. D. GUNN *South Midlands Representative*
W. F. CARTWRIGHT *Southern Counties Representative*

**Friday March 28th**

A. M. PERKS *West of England Representative*
F. E. KNIGHT *North Midlands Representative*
L. PIPER *Representative for Scotland*
J. G. WATERHOUSE *E. Lancs. & N. Wales Representative*
J. G. WRIGHT *North England Representative*
D. HASKELL *Southern Counties Representative (S.E.)*
W. BYWATER *Eastern Counties Representative*
A. D. BAKER *Yorks. and N. Lincs. Representative*

**Saturday March 29th**

A. M. PERKS *West of England Representative*
F. E. KNIGHT *North Midlands Representative*
J. G. WATERHOUSE *E. Lancs. & N. Wales Representative*
J. G. WRIGHT *North England Representative*
D. HASKELL *Southern Counties Representative (S.E.)*
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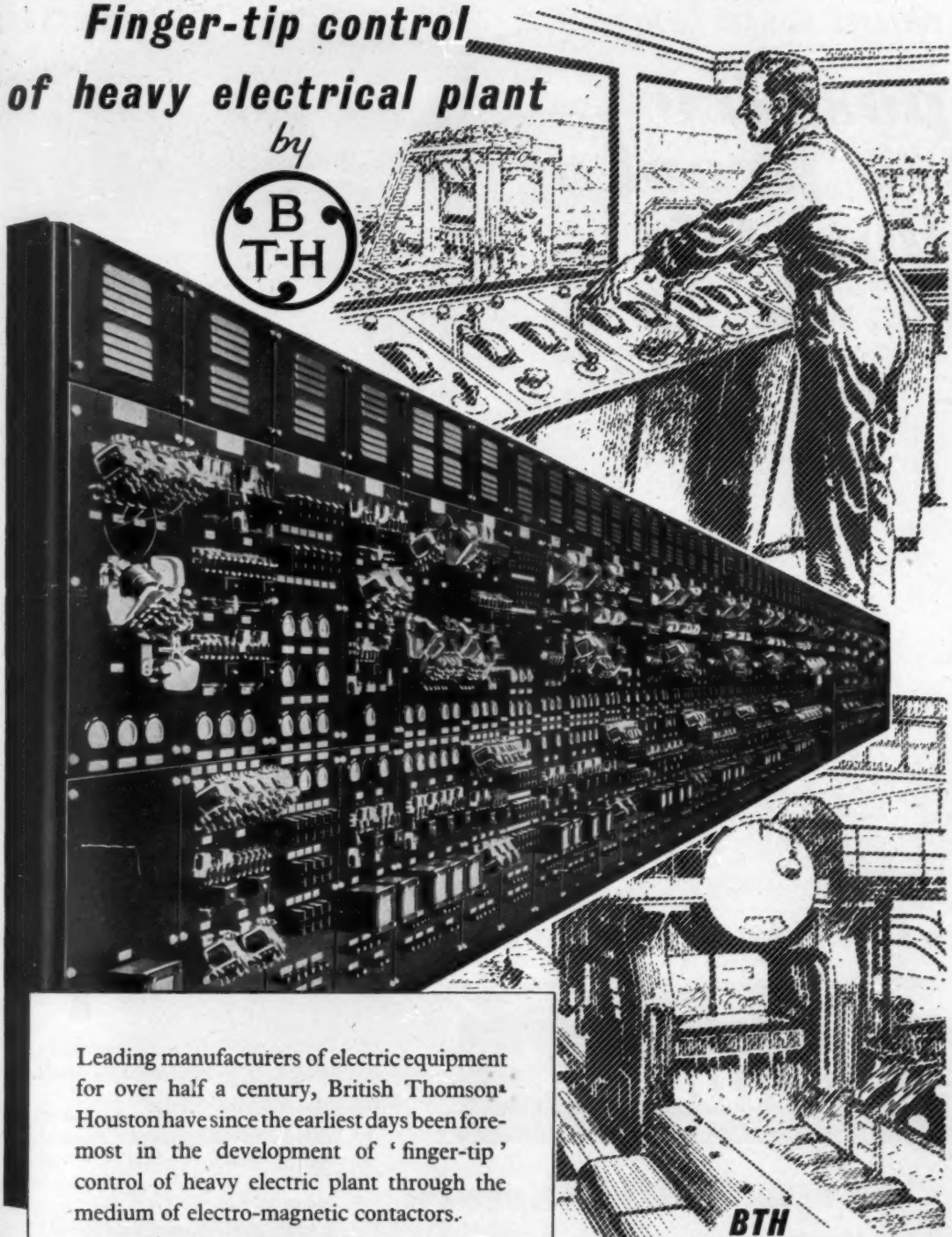
**MIDLAND ELECTRIC MANUFACTURING CO. LTD., TYSELEY, BIRMINGHAM 11**

# Finger-tip control of heavy electrical plant

by

B T-H



Leading manufacturers of electric equipment for over half a century, British Thomson-Houston have since the earliest days been foremost in the development of 'finger-tip' control of heavy electric plant through the medium of electro-magnetic contactors.

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## . . . actual motor-load life tests!

The life of starter contacts should not be forecast from their loss of weight after a few thousand operations because the rate of wear can, of course, vary considerably. The most reliable method is to use the starter for *stopping and starting a motor repeatedly until the contacts are burnt away.*

Such tests are now proceeding on Crabtree Type B-15 starters taken at random from warehouse stocks. To date, the starters have given the following operations (start and stop) without change of contacts or other components: (a) controlling a 5 h.p. motor: 2,750,000 operations; (b) controlling a 1 h.p. motor: 2,750,000 operations.

***these tests are continuing***

## facts about Crabtree Type B-15 starters

**Crabtree**

**Type B-15 starters**

1 *The first and still the leading starter of 'unit' construction.*
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3 *Built-in, on-load, interlocked isolating switch unit can be added. Fuses to B.S.88:1952, Cat. 440 AC4 are optional.*
4 *Enclosures for general purpose and heavy industrial use.*
5 *Frontal access to all terminals and components.*
6 *Built-in trip signalling.*
7 *Single-screw fixing for additional auxiliary contacts.*
8 *Rating. Motor load:* 15 *amp.* (10 *h.p.* 415 *volts.* 3 *phase*), *Non-inductive load:* 25 *amp. per pole.*

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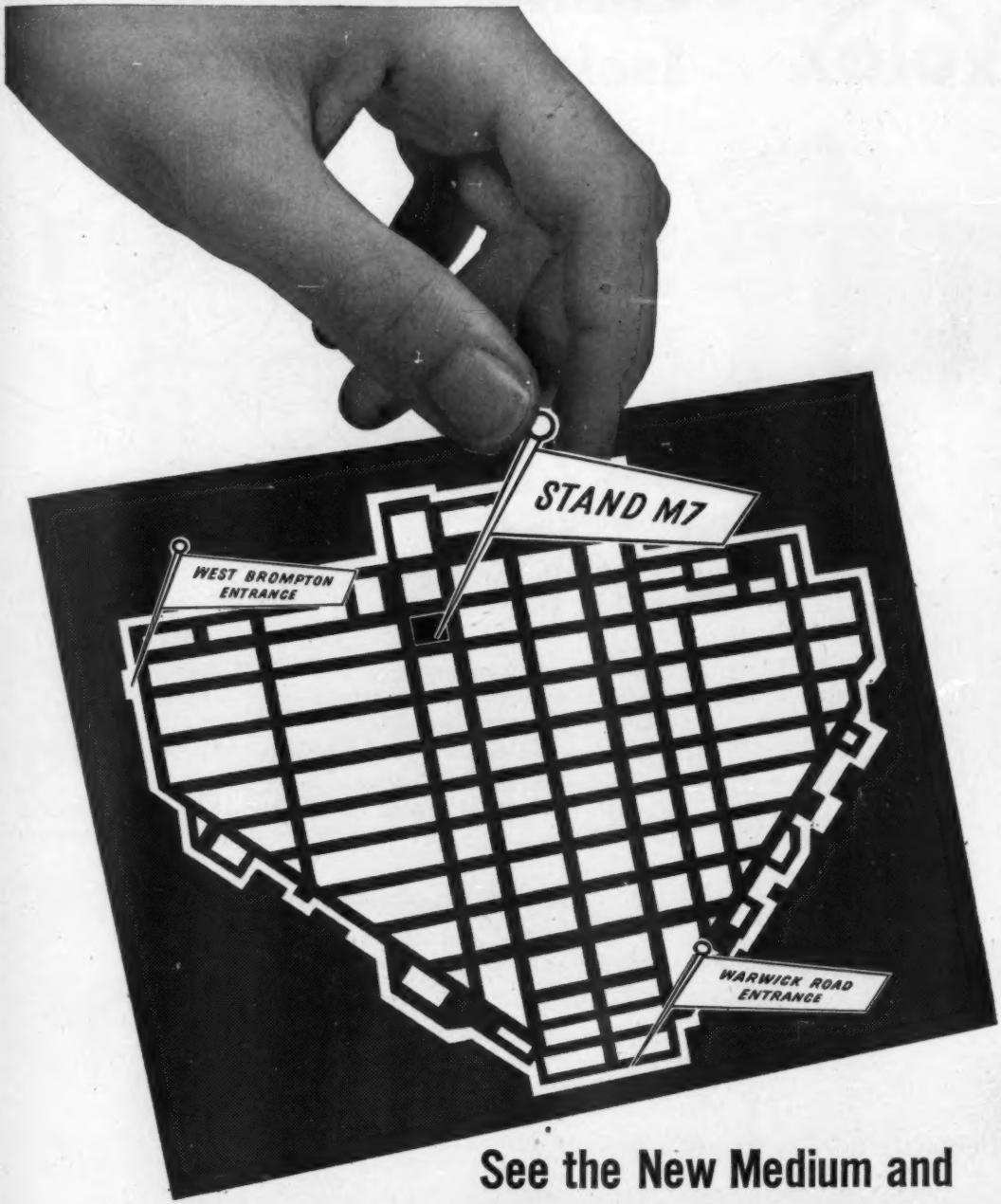
## ELECTRICAL ENGINEERS EXHIBITION · EARLS COURT MARCH 25th-29th

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**INSULATED COVER**
**With or without Pilot Light**

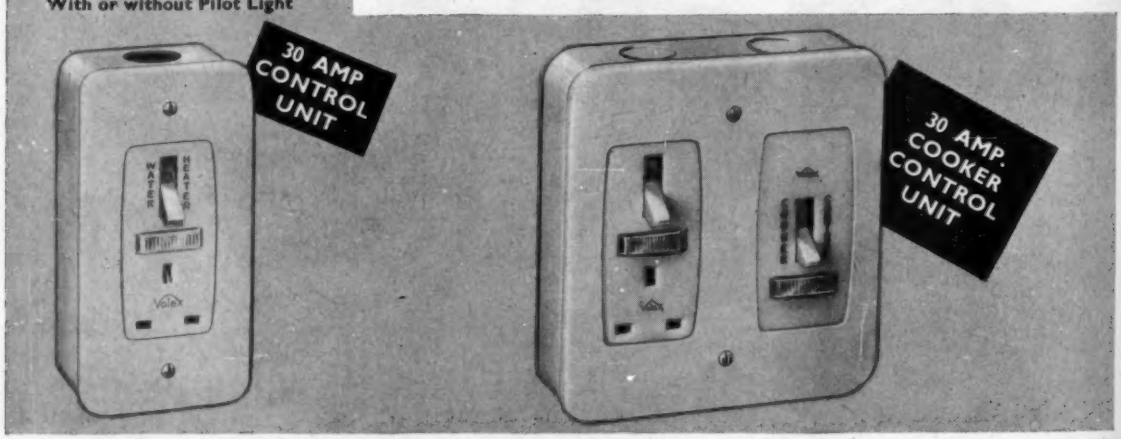
**METAL CLAD**
**With or without Pilot Light**

In this small space it is impossible to detail the many advantages of this extremely adaptable and comprehensive range of 30 amp. D.P. Isolating Switches and Control Units.

Available now from your usual Wholesale Suppliers.

For full information and Prices send for leaflet No. 358/CU or better still, **VISIT US AT STAND F2, AT THE A.S.E.E. EXHIBITION.**

**STAND F2**

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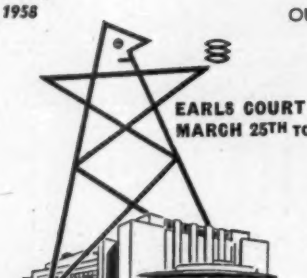
## at the Electrical Engineers Exhibition

**Walsall**

**Stand No. G·7**

A·S·E·E 1958

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"Belling"

## BABY BELLING No. 52

- Available on stand 45/- extra.
- Large easily controlled oven with heat indicator.
- Large grill-boiler keeps three pans on the boil and roasts, grills or toasts at the same time.
- Cooks largest joint to perfection.
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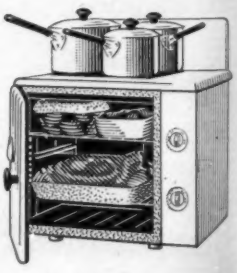

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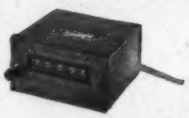

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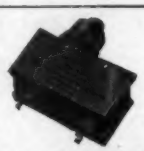

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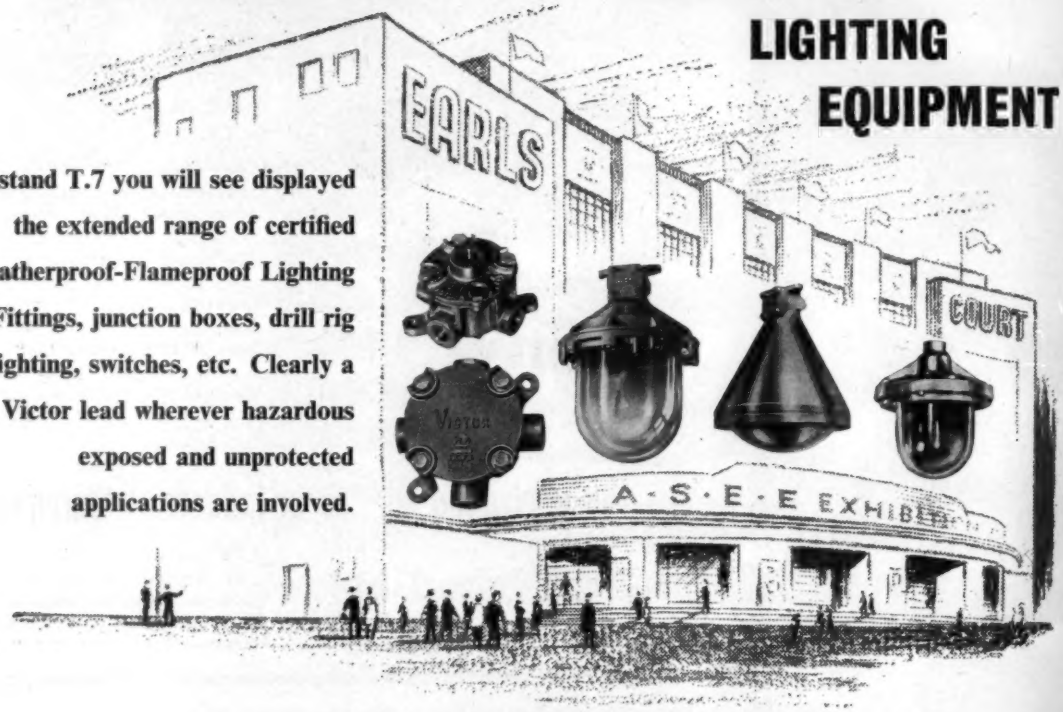
## WEATHERPROOF— FLAMEPROOF LIGHTING EQUIPMENT

**On stand T.7 you will see displayed the extended range of certified Weatherproof-Flameproof Lighting Fittings, junction boxes, drill rig lighting, switches, etc. Clearly a Victor lead wherever hazardous exposed and unprotected applications are involved.**




**See the latest "INCREASED SAFETY" lighting fittings for dangerous or remotely dangerous areas on STAND T.7 (FIRST FLOOR) at the A.S.E.E. Exhibition.**

## If its lighting—its Victor!

**VICTOR PRODUCTS (WALLSEND) LTD. WALLSEND-ON-TYNE · ENGLAND**
Telephone: Wallsend 68331 (6 lines) Telegrams: 'Victor' Wallsend
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# UNIT AND CUBICLE CONSTRUCTION SWITCHBOARDS

*Illustration on right shows an indoor totally enclosed unit construction type "Y" switchboard with incoming duplicate busbars feeding common outgoing circuits by means of interlocked fused switches of both 300 amp and 500 amp capacity.*

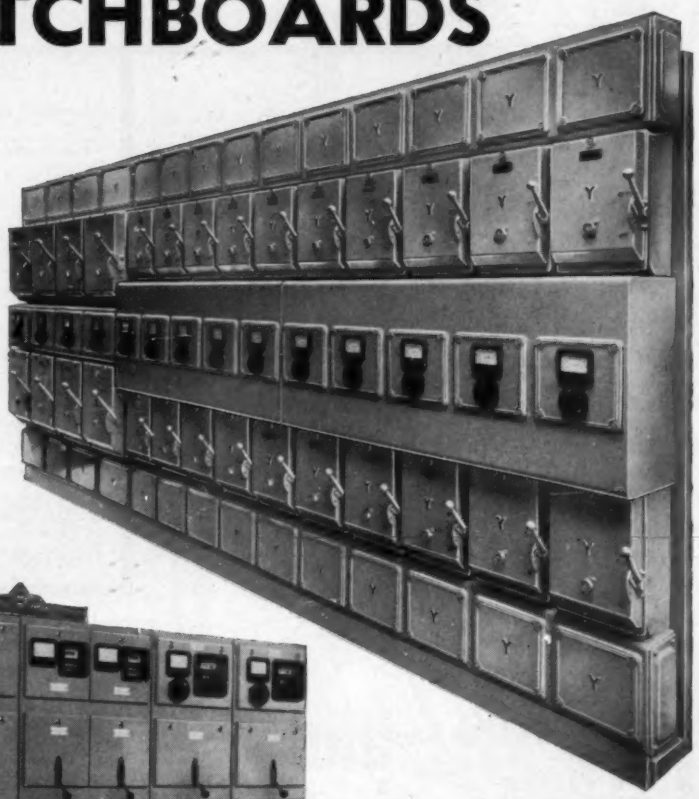

*Illustration below shows an indoor all-isolating cubicle construction switchboard having individual metering on the outgoing fused switches of 60 amp, 160 amp and 300 amp capacity.*

Patent No. 783957

We specialise in building switchboards to your exact requirements with facilities for extension. Designed to give unfailing service under the most onerous climatic conditions whether installed indoors or out of doors.

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*Associated with Yorkshire Switchgear and Eng. Co. Ltd.*

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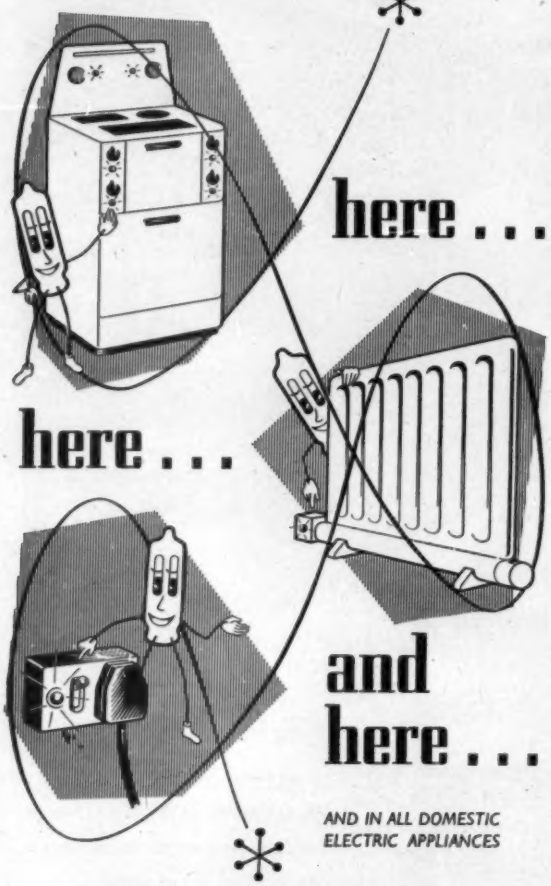


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- No filament to fracture.
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Output-shaft has 12 positions.
Integral Wormgear Reduction.
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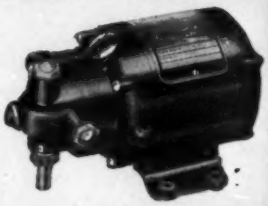

**SERIES WOUND GEARED MOTOR—Type 'K'**

| R.P.M. | TORQUE | R.P.M. | TORQUE |
|---|---|---|---|
| 600 | 10 oz. in. | 37.5 | 4 lb. in. |
| 300 | 16 oz. in. | 25 | 4 lb. in. |
| 150 | 24 oz. in. | 18.8 | 4 lb. in. |
| 100 | 32 oz. in. | 12.5 | 4 lb. in. |
| 75 | 36 oz. in. | 9.4 | 4 lb. in. |
| 50 | 3 lb. in. | 6.25 | 4 lb. in. |

**SHADED-POLE INDUCTION GEARED MOTOR—Type 'FA'**

| R.P.M. | TORQUE | R.P.M. | TORQUE |
|---|---|---|---|
| 216 | 4 oz. in. | 13.5 | 24 oz. in. |
| 108 | 7 oz. in. | 9 | 30 oz. in. |
| 54 | 10 oz. in. | 6.7 | 35 oz. in. |
| 36 | 12 oz. in. | 4.5 | 44 oz. in. |
| 27 | 15 oz. in. | 3.35 | 3 lb. in. |
| 18 | 20 oz. in. | 2.25 | 4 lb. in. |

**VARIABLE SPEED GEARED MOTOR—Type 'KQ'**

| R.P.M. | TORQUE | R.P.M. | TORQUE |
|---|---|---|---|
| 200-600 | 9 oz. in. | 12-37.5 | 4 lb. in. |
| 100-300 | 16 oz. in. | 8-22 | 4 lb. in. |
| 50-150 | 20 oz. in. | 6-16.5 | 4 lb. in. |
| 32-100 | 32 oz. in. | 4-11 | 4 lb. in. |
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| 16- 50 | 48 oz. in. | 2- 5.5 | 4 lb. in. |

**CAPACITOR INDUCTION GEARED MOTOR—Type 'N'**

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|---|---|---|---|
| 456 | 8 oz. in. | 28.5 | 3 lb. in. |
| 228 | 13 oz. in. | 19 | 4 lb. in. |
| 114 | 21 oz. in. | 14.2 | 4 lb. in. |
| 76 | 26 oz. in. | 9.5 | 4 lb. in. |
| 57 | 32 oz. in. | 7.1 | 4 lb. in. |
| 38 | 44 oz. in. | 4.75 | 4 lb. in. |

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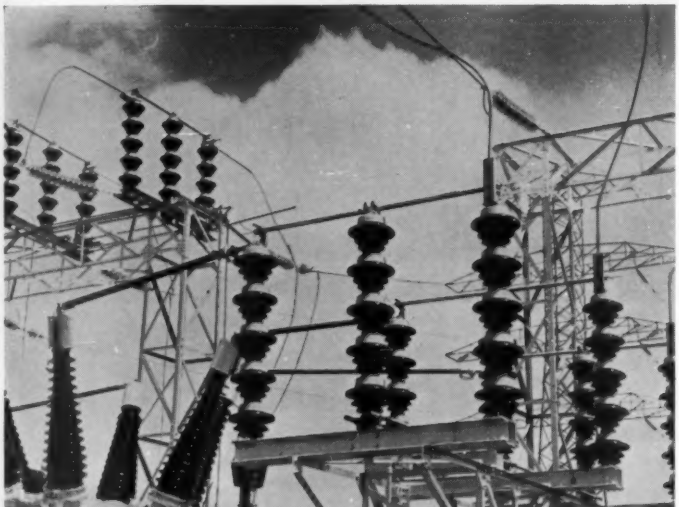
## ELECTRICAL ENGINEERS EXHIBITION

**MARCH 25th—29th 1958**

***We extend an invitation to all Engineers to visit us on STAND U.7 (first floor), where our technical staff will be pleased to demonstrate and discuss our products, which will include re-designed Interrupter Heads; also improved Single and Repeater, Expulsion fuse cut-outs, with fault capacity up to 150 MVA at 11 kV 3-phase.***

Specialist Manufacturers of High Voltage Outdoor Switch and Fuse Gear for all voltages from 3.3 kV to 400 kV.



LEL Switches at "Juja" Sub-Station. By courtesy of the Kenya Power Co. Ltd. (Design and Construction by Balfour Beatty & Co. Ltd.)

- ★ ISOLATING SWITCHES, POWER OR MANUALLY OPERATED
- ★ "LOAD BREAK" SWITCHES (with Interrupter Heads)
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- ★ H.V. FUSES
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A*

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FOUNDER MEMBERS OF THE C.M.A.

Connollys Paper Insulated Cables are serving all fields of industry where voltages from 1,100 to 11,000 are required. Construction conforms with British Standard and C.M.A. Specifications, and the craftsmanship conforms with Connollys tradition of constant progress.

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**A.S.E.E EXHIBITION, EARL'S COURT**

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Of course you meet problems at times, when power supplies have to be made available for Domestic and Industrial use. But, they are not your problems alone, Mersey Cables share them—and solve them, offering solutions to meet your individual needs.

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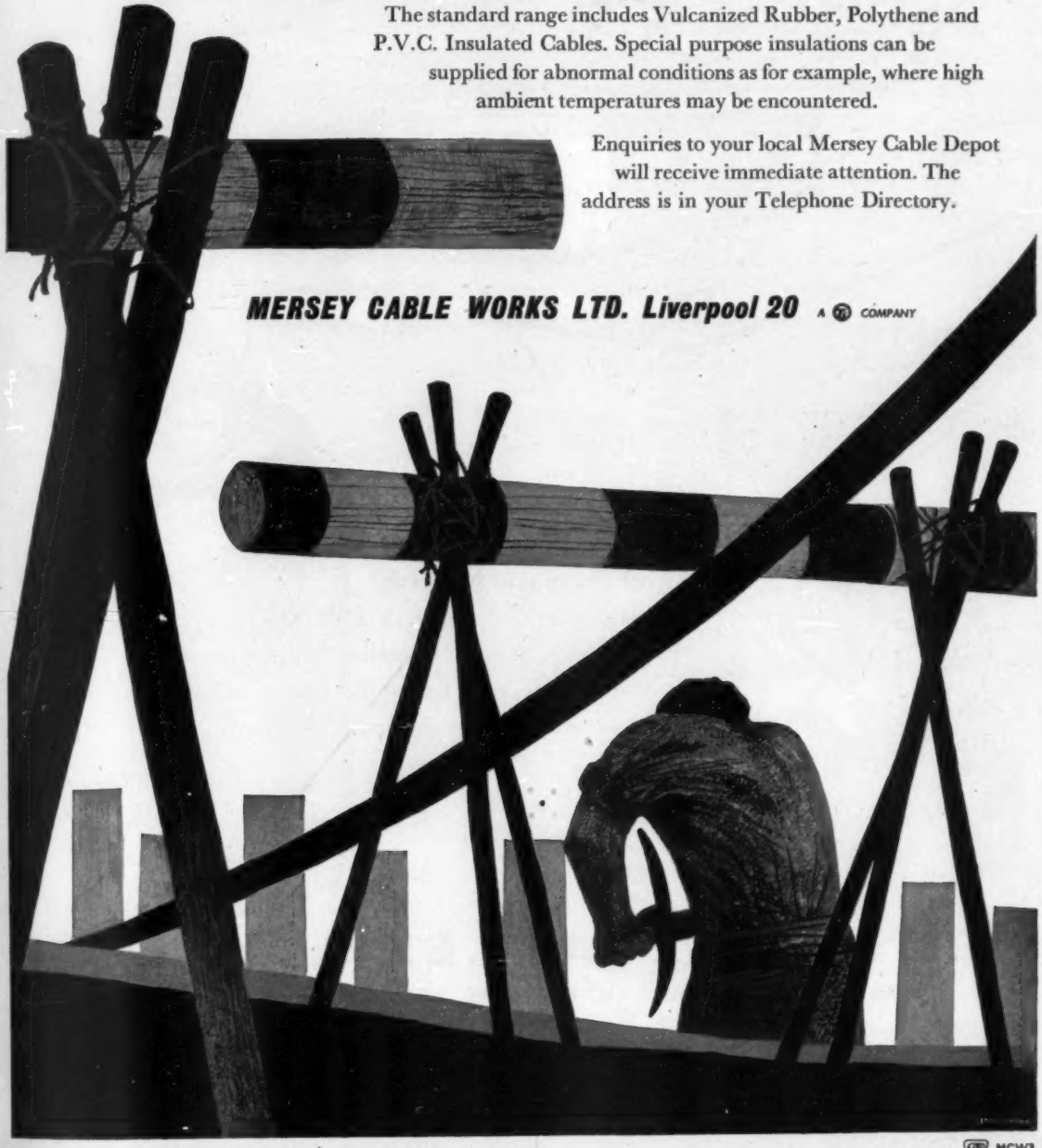
The standard range includes Vulcanized Rubber, Polythene and P.V.C. Insulated Cables. Special purpose insulations can be supplied for abnormal conditions as for example, where high ambient temperatures may be encountered.

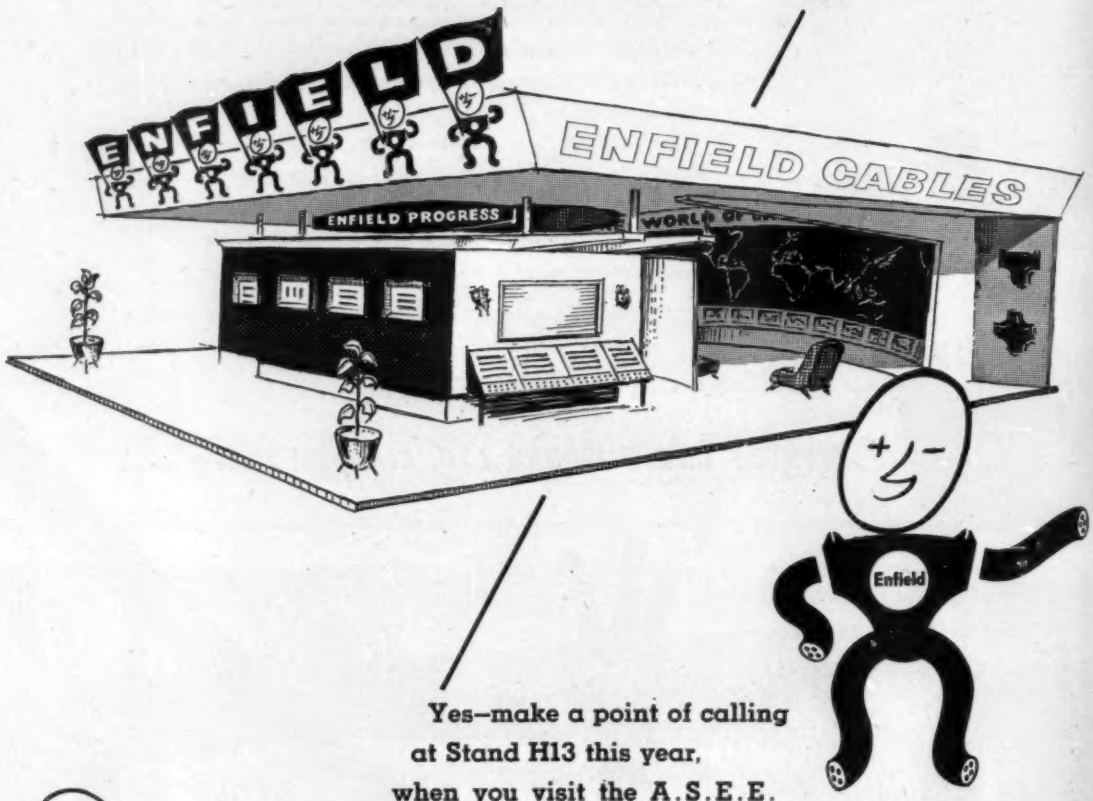
Enquiries to your local Mersey Cable Depot will receive immediate attention. The address is in your Telephone Directory.



**MERSEY CABLE WORKS LTD. Liverpool 20** A GKN COMPANY

MCW3

# Good news at H13!




**Yes—make a point of calling at Stand H13 this year, when you visit the A.S.E.E. Exhibition. Some interesting developments are afoot at Enfield, and we would like to tell you about them. We look forward to seeing you.**

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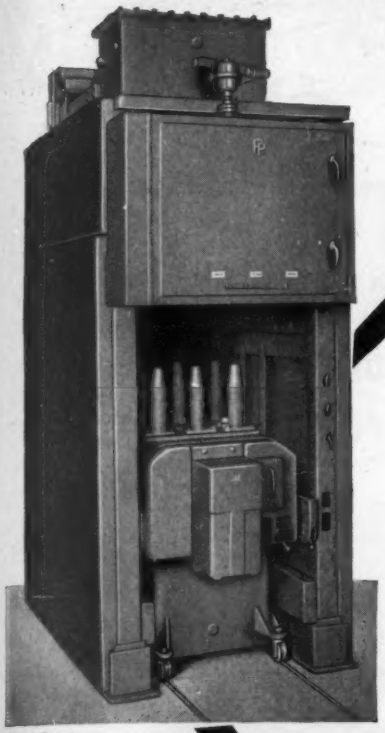
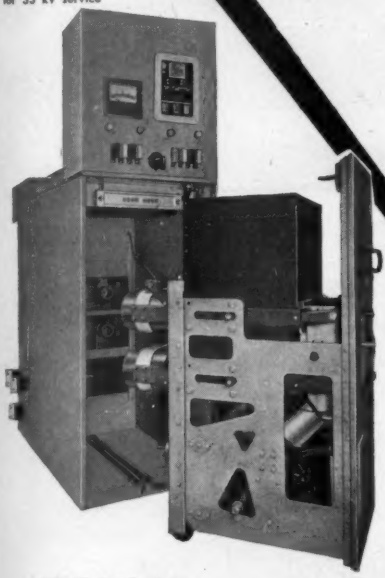


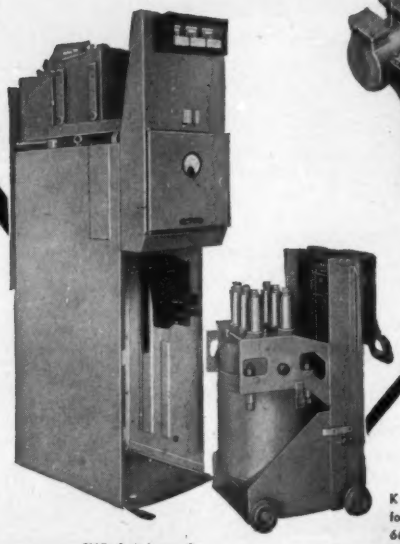
# "FP" Switchgear AT EARLS COURT A·S·E·E 1958

On **Stand G.11** at the Electrical Engineers' Exhibition will be found examples of the wide range of medium and high-voltage Switchgear manufactured by 'Ferguson Pailin'.

VSLP 9 Switchgear for 33 kV service



ASB 37 Switchgear for 3.3 kV-250 MVA service



BVC Switchgear for service up to 11 kV 150/250 MVA

OFS and IB4 Switchgear for service up to 11 kV-250 MVA

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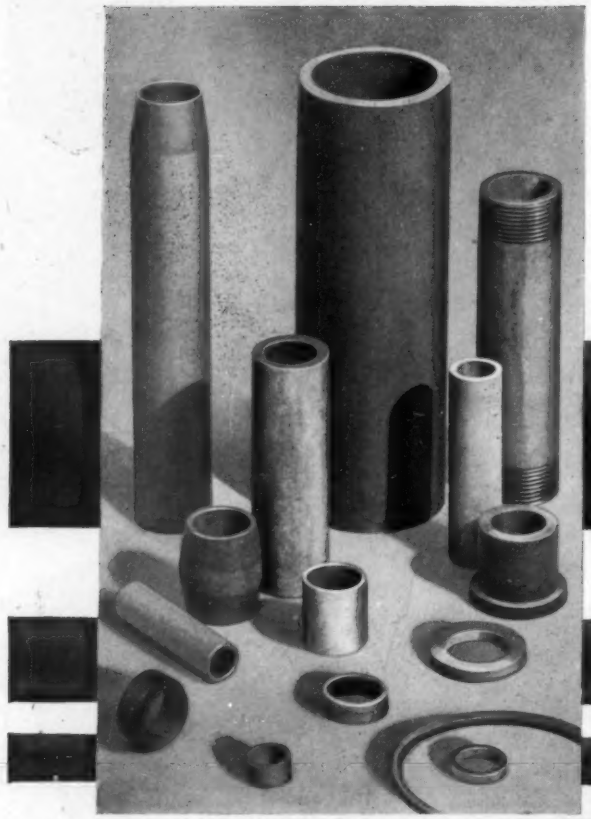

"CASTLE" vulcanised fibre tubes are used extensively for mechanical and electrical purposes. Manufactured to B.S.S. 934, "CASTLE" tubes are light, tough, easily machined and possess a high dielectric strength.

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- ★ Can be fitted **after** the terminal is fixed.
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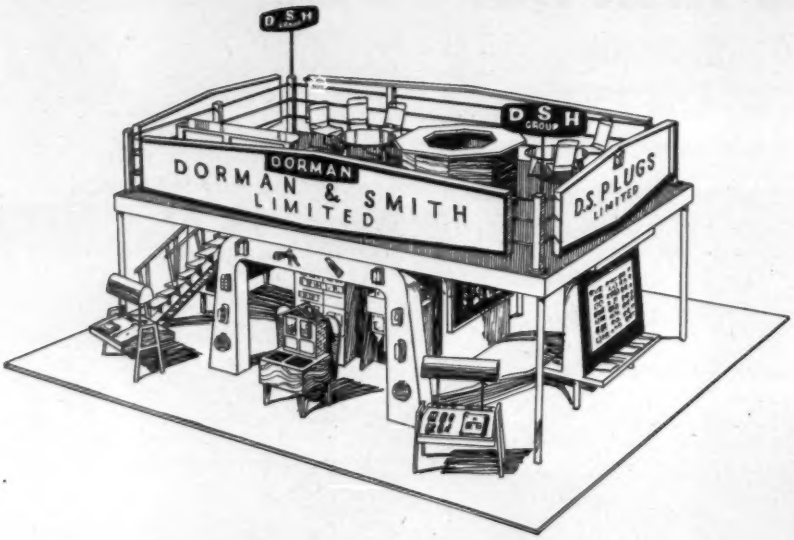
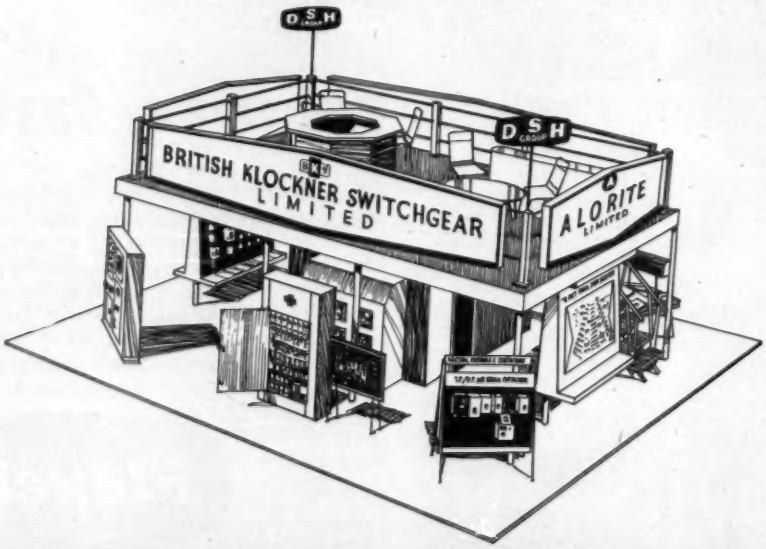
# DORMAN SMITH




On Stand G.10 at the 1958 Electrical Engineers Exhibition can be seen many products of the companies in the Dorman Smith Group which includes Dorman & Smith Ltd., D.S. Plugs Ltd., British Klockner Switchgear Ltd., and Alorite Ltd.

*Visit STAND G10 and see the*

# H GROUP stand G10

DORMAN

## DORMAN & SMITH LTD.

Industrial equipment displayed on this section of the stand includes a switchboard built from Dorman standard units. Designed for simplicity and speedy erection—the installation of the board can be carried out by the customer's own electricians in a few hours. The technique of construction using standardized units is now being applied to cubicle switchboards and an example of this type of equipment is also shown on the stand.

On the domestic side we are exhibiting a new Domestic Unit which incorporates up to 10 Loadmaster miniature circuit breakers. This unit completely eliminates the use of fuses in the home.

A representative selection of the company's range of industrial and domestic products completes this section of the stand.

BKS

## BRITISH KLOCKNER SWITCHGEAR LTD.

Visitors can see our range of control gear of various types for industrial use. Standard ranges of contactors and motor starters contrast with custom built units for special duties. Contactors for general and heating control duty will also be displayed together with a panel for the automatic control of a shell moulding sand preparation plant, and a cubicle type multi-motor control panel.

One of the most interesting exhibits is a complete control system for the stage of a London theatre including a control cubicle for the automatic preset contour patterning of the curtain from a remote mimic.

DS

## D.S. PLUGS LTD.

On display will be many types of electrical accessories for industrial and domestic use. A comprehensive range of well designed sturdy fused plugs and sockets, cooker control units, etc. is highlighted by special items like the range of King Pin fused plugs which permit fuse changing in seconds without the aid of coins, screwdrivers, etc. Another novelty item with great sales appeal is the King-Pin fuse tester torch which gives the ever useful pocket torch even greater value.

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## ALORITE LTD.

Alorite is a recent scientific development in ceramics. Originally intended for special application—its use was considerably extended when its unique characteristics were realized. Alorite is highly resistant to thermal and mechanical shock, non hygroscopic, extremely hard and possesses high dielectric strength. It can be ground, highly polished and produced in colours.

Alorite products exhibited include :— Tri-post terminals, Mini-leads, Insulators, and H.R.C. cartridge fuse link bodies.

Perhaps Alorite can provide the answer to one of your ceramic problems ?

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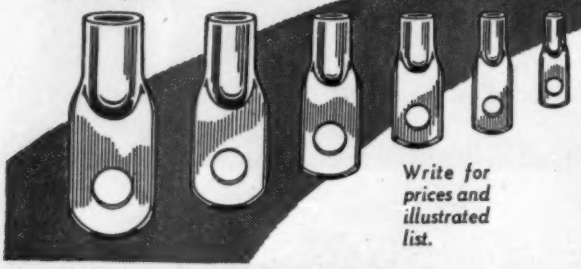
1,000 amps.



15 amps.

COPPER TUBULAR CABLE SOCKETS

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MERCURY SWITCHES

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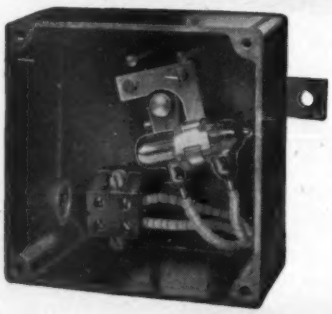

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All types accurate to ± 1%
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It could even happen—and uncertainty is never funny. No need for long faces, however, even on Long Island. In a doubting world there are some things that can be relied upon. Industry certainly relies on the 5 kVA to 4000 kVA capacity transformers made by Lindley Thompson.

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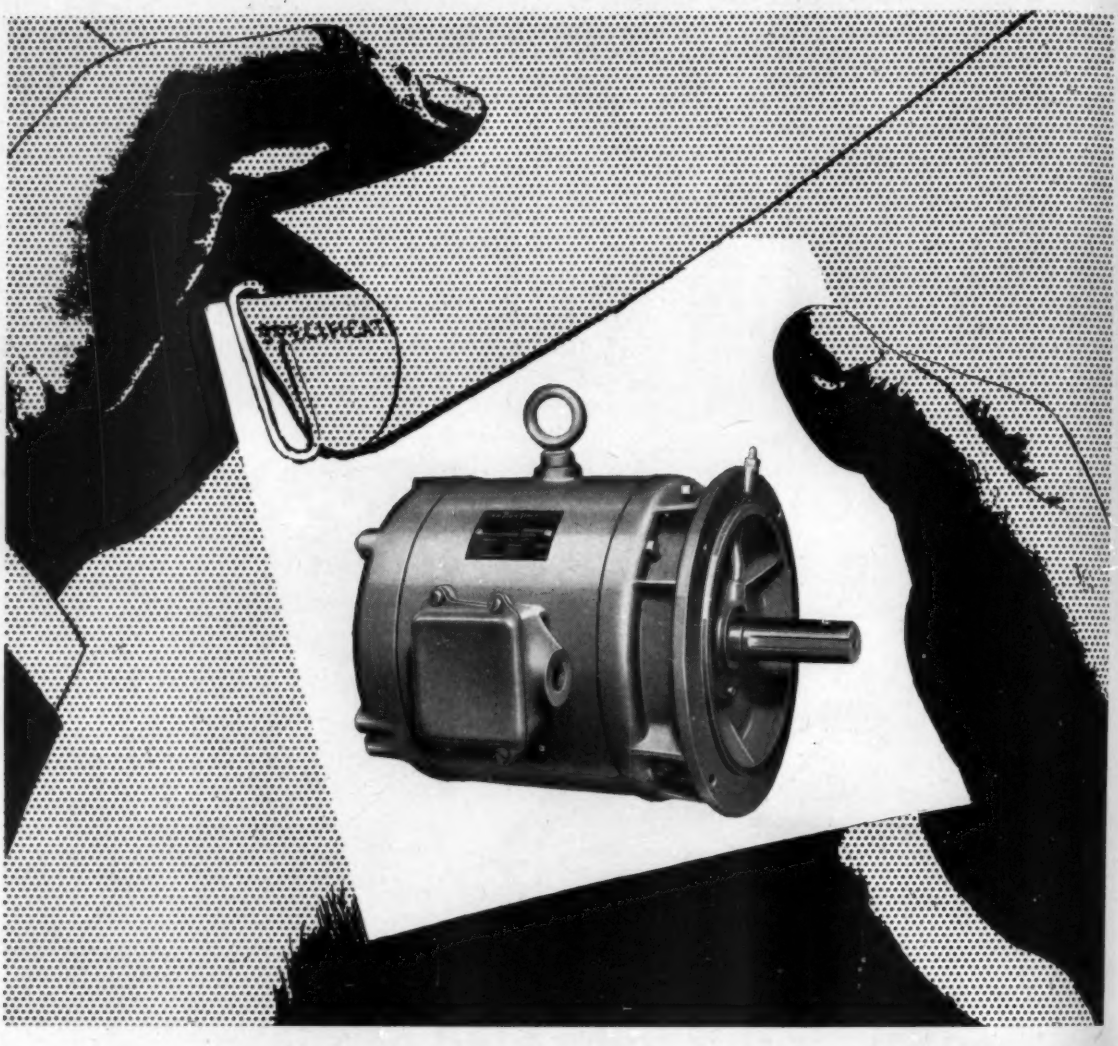

# We tell you all we can, but . . .

Take a Series 5 motor: we can tell you that it conforms electrically to B.S.2613 for class E insulation and for frame sizes and dimensions to the new B.S.2960, that it costs less; that it is lighter and takes up less space because the frame size is smaller than any previous standard motor of the same horsepower; that the double fan cooling is extremely efficient and the cooling air — exhausted centrally through large openings — leaves with a low velocity that is quickly dissipated.

We can tell you what bearings we use and what kind of slot insulation. We can give you all the information in our power about any other A.C. motor from 1 to 300 h.p. made at our Guiseley Works . . . but still we should not have told you the most important thing — that the motor carries the name . . .

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*Member of the Nuclear Power Consortium:*
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**REDUCED PRICES AS FROM 1st MARCH 1958**

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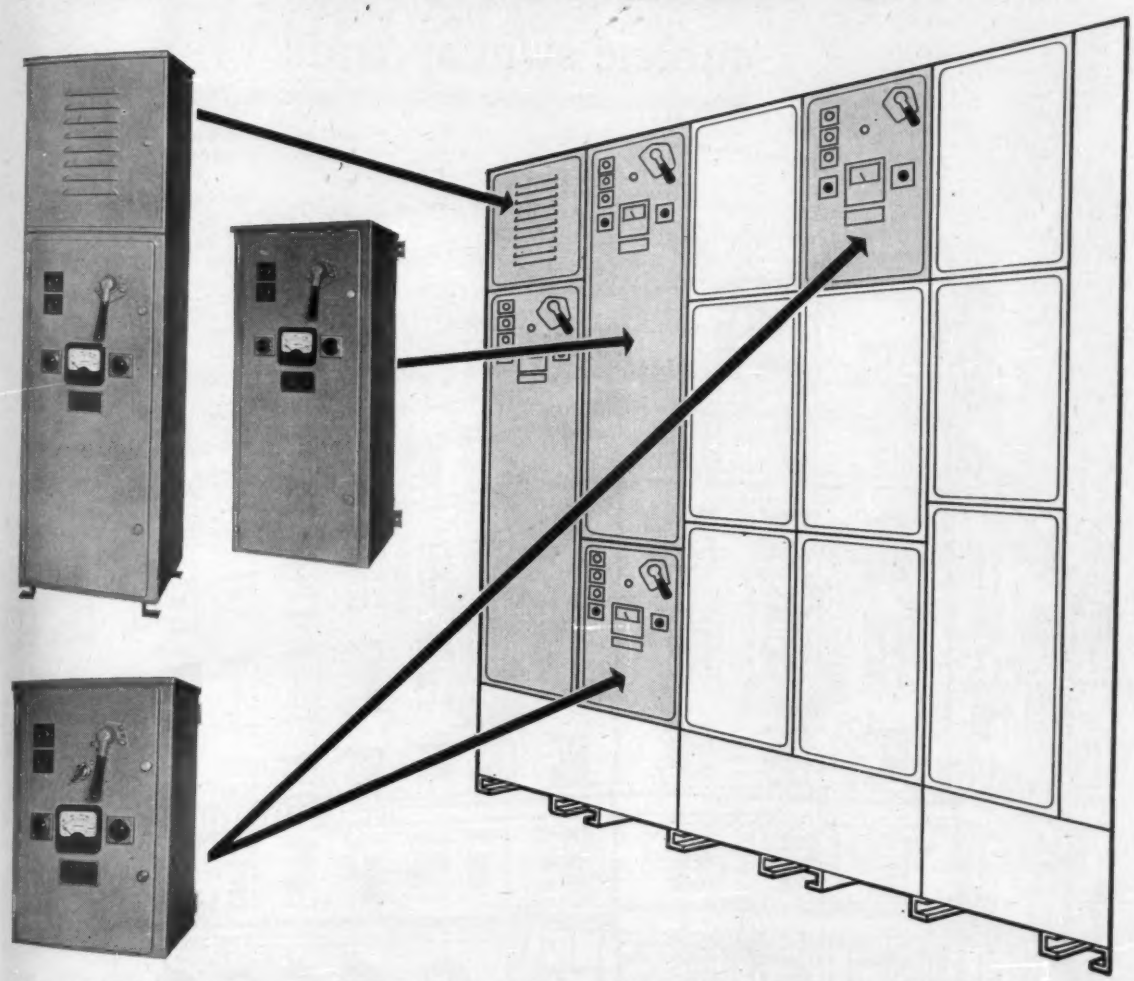
# NEW WATFORD S type AUTOMATIC STARTERS



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- Rigorously tested at WATFORD Short Circuit Testing Station and complying with latest B.S. 587 and other Specifications.
- High Performance, Quality Control Gear at Competitive Prices.

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5-50 h.p. Direct Switching, Star Delta, Auto-Transformer, Slip-ring in cases of same cross section. Units are flush sided with common increments in height, so enabling Starters of any type and horse power to be uniformly grouped on common mounting frame or Busbar chamber.

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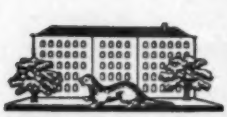
STAND No. M.3

*Architect: Victor Heal & Smith, F/F.R.I.B.A.*
*Electrical Contractors: Drake & Gorham (Contractors) Ltd.*



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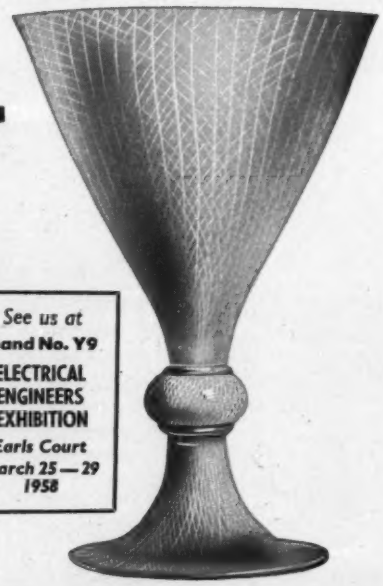

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*March 25—29*
*1958*

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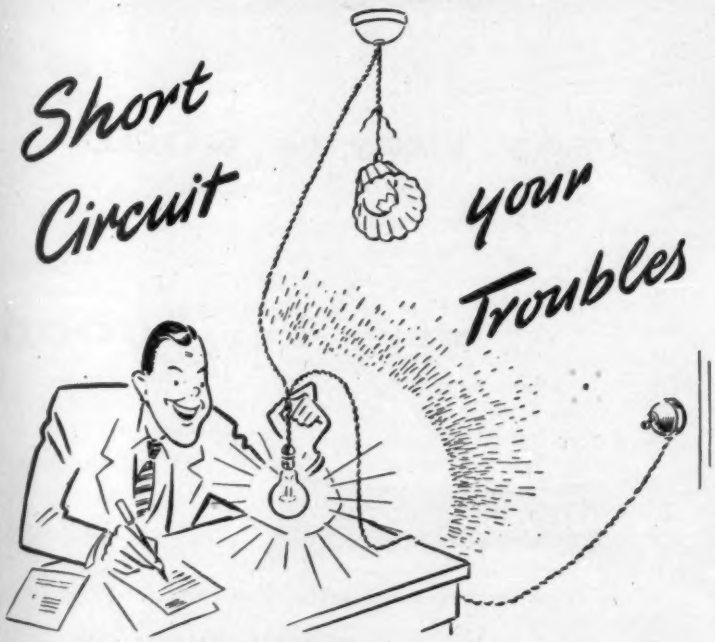

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One of these is the earliest authentic example of a ball thrust bearing, the device consisting of two wooden discs and eight bronze balls with trunnions. It is conjectured that the upper disc carried a central statue with smaller statues grouped round it, the whole revolving on a central peg and turning to bring all aspects of the statue successively into view.

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It is one application of many where SKF bearings are used. Other thrust-type bearings from the unique range of bearing types manufactured by SKF include single and double thrust ball bearings, taper roller bearings and spherical roller thrust bearings.

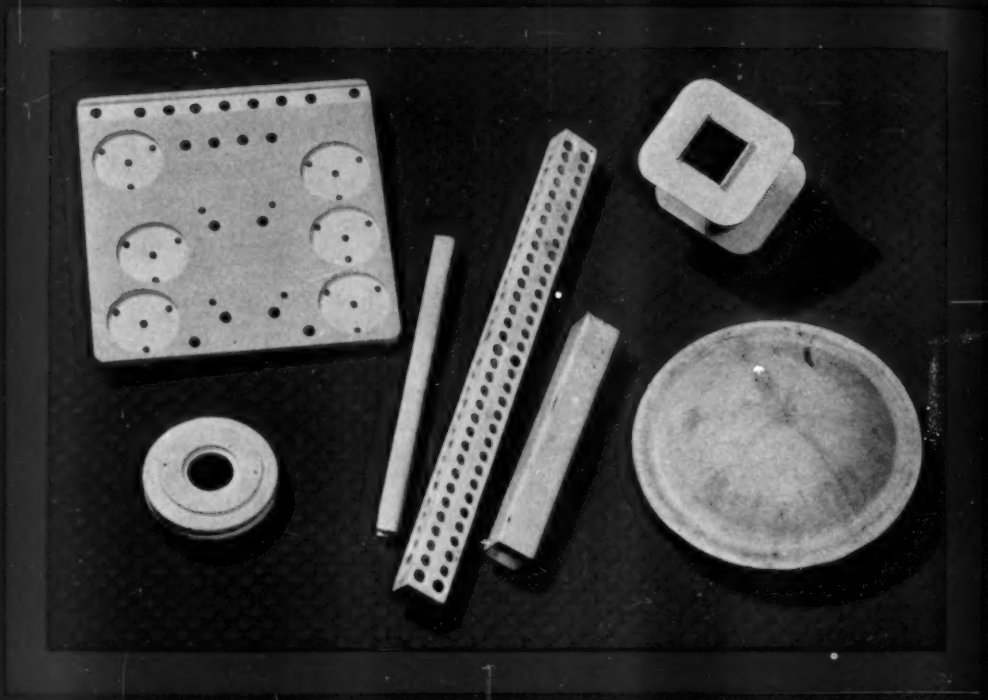
SKF

**THE SKEFKO BALL BEARING COMPANY LIMITED · LUTON · BEDS**

THE ONLY BRITISH MANUFACTURER OF ALL FOUR BASIC BEARING TYPES: BALL, CYLINDRICAL ROLLER, TAPER ROLLER AND SPHERICAL ROLLER

G150

# ELECTRICAL INSULATION



Woven glass laminates are available bonded with Silicone, Epoxy, Polyester and Phenolic resins to give a range of electrical insulating components up to Class 'H' and 'C' of BS.2757.

The very high mechanical strength and negligible water absorption of the sheets, tubes and mouldings which we manufacture are features which today's designers are finding of importance.

Technical data and samples are readily available upon request.

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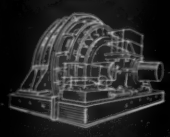
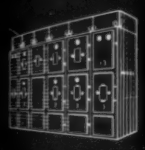


**PLANT**
Rolling Mill Motors for Steelworks

**MOTORS**
150 h.p. Type MDX motors



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Desks & Contactor Boards for Centralised Control

**X-RAY EQUIPMENT**
For all industrial applications.

***IN STEELWORKS*** as in every sphere of Industry, Metropolitan-Vickers are in the forefront of Electrical progress. Many advances in the design of drives and controls for use in steelworks, owe their origin to the research, enterprise and experience of this great organisation

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*An A.E.I. Company*

**LEADING ELECTRICAL PROGRESS**

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# every operation

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## GREATER CIRCUIT FLEXIBILITY...

. . . with these new space-saving pushbuttons, selector switches and indicating lights which offer amazing opportunities for simplified compact control panel design and an almost unlimited number of combinations.

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## heavy duty oil-tight control units

*Full particulars on application to Publicity Dept.*

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For every modern industrial process there is a specialised grade of Sea Shell Lubricant.

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*And robes the mountain in its azure hue.*
*(Pleasures of Hope by Thomas Campbell)*

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Irish cables are manufactured under scenery depicted above, showing the famous and beautiful Mourne Mountains

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*incorporating*
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MARCH 25th to 29th 1958
STAND No. S.16

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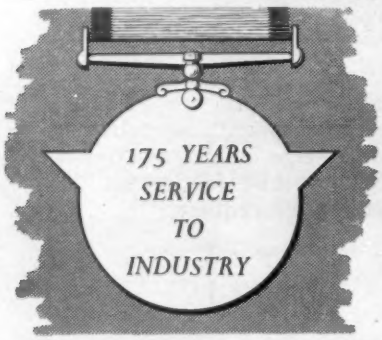


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## H. C. COPPER

**STAND H. 18**
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**FOR ALL ELECTRICAL PURPOSES**

**Manufacturers of copper and copper-base alloys in the form of wire and strand, bar and rod, sheet, strip and foil, busbars, commutator and other sections, and tubes.**

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Up to 10" wide x 1" thick or 3" square drawn finish; up to 12" x ¾" x 16 ft. hard rolled. Extra heavy machined bars to customers' requirements. Tubular and laminated busbars.

**Pre-assembly work on busbars.**
Facilities are available in our Works for bending, sawing, drilling, slotting, and tinning to customers' requirements.

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Plain and tinned, drawn, rolled, rolled and drawn, or rolled and sheared. Sheets up to 10 ft. x 4 ft. in any thickness over $\frac{1}{32}$"; thinner sizes 6 ft. x 3 ft. or 4 ft. x 2 ft. Foil down to 0.0005" thick.

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For E.H.T. busbars and connections. Supplied on drums to customers' requirements.

**O.F.H.C. COPPER**
Wire, strip, sheet, and tubes.

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For rotor and stator windings of direct-cooled alternators and other electrical equipment.

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'COMBARLOY' and H.C. copper. All sizes and sections; bars in random or exact (single and multiple) lengths; segments sawn or stamped to shape. Stepped and other special sections. Double taper bars.

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For railways, trolley buses, tramways, crane tracks, etc. Round, grooved and special sections. Manufactured in long lengths weighing up to 18¾ cwt. quite free from joints of any description (e.g. 1,440 yards of 0000 S.W.G. wire [0.125 sq. in.]); and up to 3 tons per drum with three joints.

THOMAS BOLTON & SONS LTD

*Established 1783*

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Visit us on
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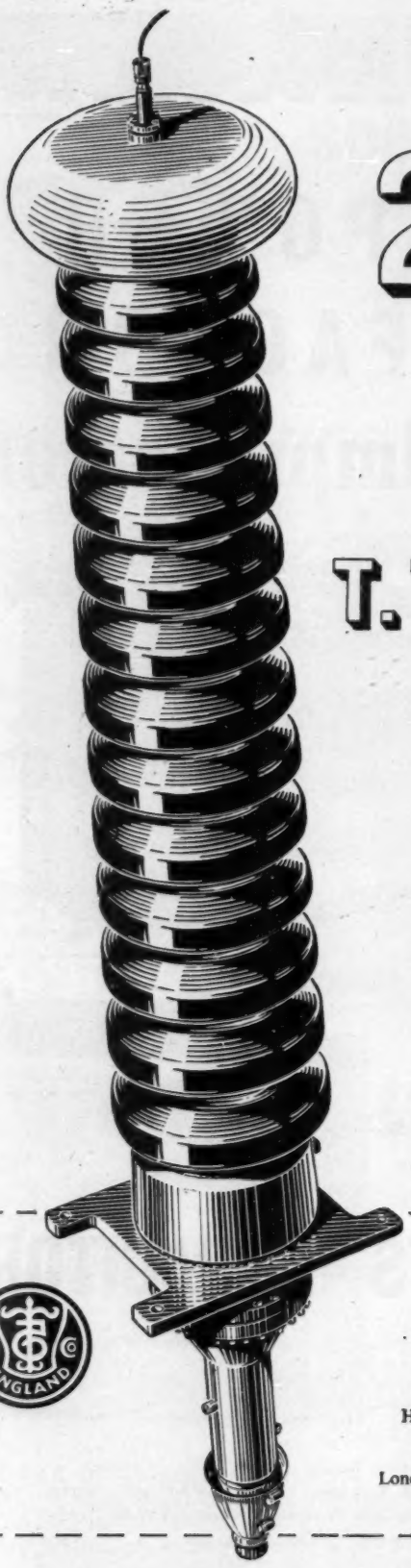
March 25th – 29th

# 230 kV.



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is the outstanding NAME in the field of
**HIGH VOLTAGE INSULATION**

230 kV high pressure oil-filled cable terminal designed by the H.V. Engineering Department, Canada Wire and Cable Company Limited, Toronto, Canada, using porcelains supplied by Taylor, Tunnicliff. Hydraulic routine test: 550 lb./sq. in.

*Wherever a new project calls for High Voltage Insulation*

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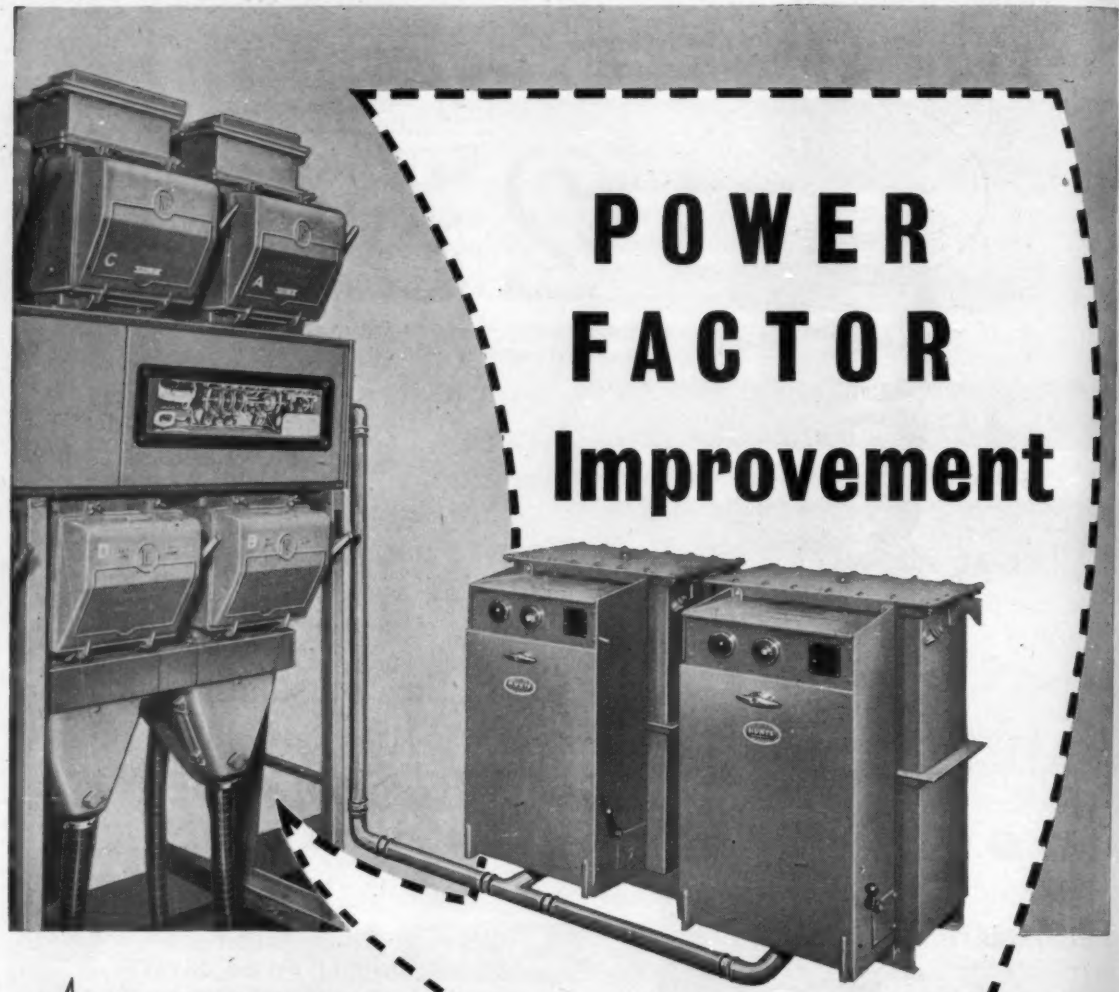

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THE TRADE MARK OF RELIABILITY

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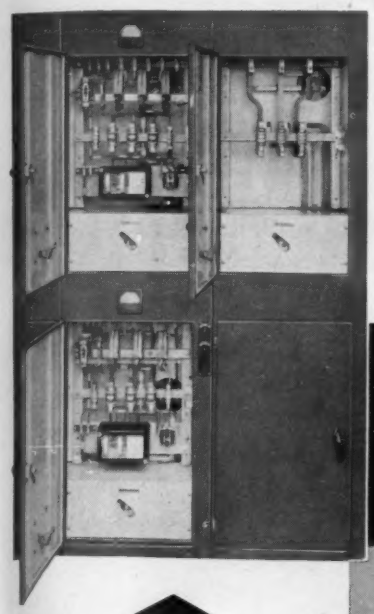

*Two section, two-tier panel, one of a series supplied to a well-known paper manufacturing firm.*

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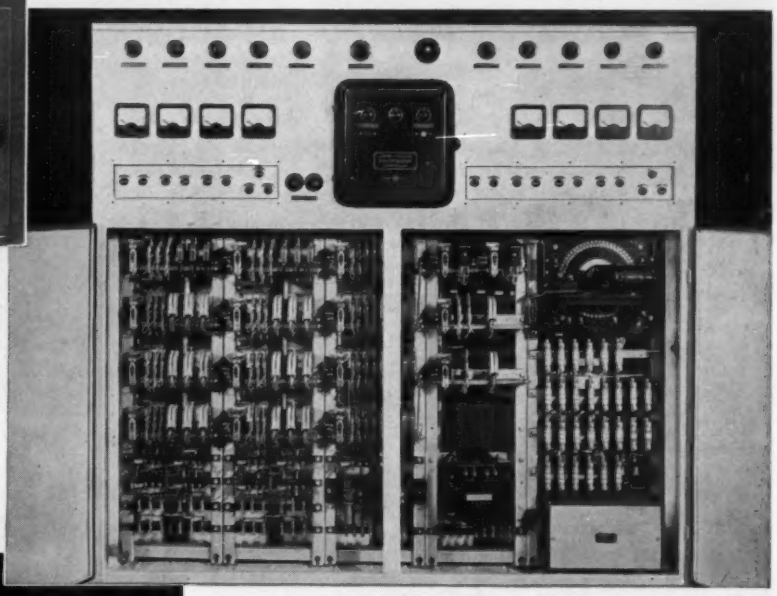
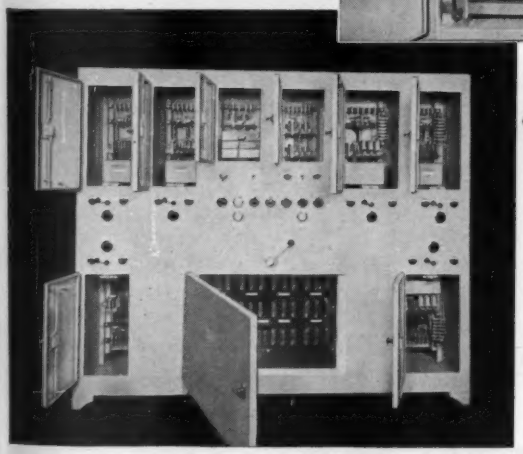
**Earls Court · March 25-29**





*Multi-motor control panel with individual compartment and isolation for each motor starter, supplied to a large synthetic fibre manufacturing concern.*

*Special purpose panel supplied for the control of an automatic brick-making plant.*

*All contactors are made to the famous G.W.B. standards. Among the many refinements making them pre-eminent in their field are:*

- **Sintered Tungsten-Silver contacts for LONG LIFE**
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- **Special coil design giving LOW CURRENT ABSORPTION**

G.W.B. Low Tension control gear 10—1,400 amps A.C. & D.C.

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**CONTROL GEAR DIVISION · P.O. BOX 4 · DIBDALE WORKS · DUDLEY · WORCS.**

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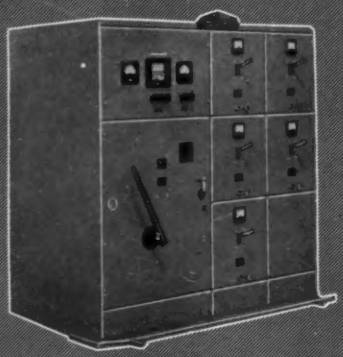
*Proprietors: Gibbons Bros. Ltd. & Wild-Barfield Electric Furnaces Ltd.*

GWB 407

# ...for A/C & D/C SWITCHGEAR

A typical example of an OPEN TYPE D/C SWITCHBOARD as supplied for Steel Works and marine installations.



A fine example of an A/C BOARD constructed for a large steelworks in this country.

The above photograph shows in some detail an A/C INDUSTRIAL TYPE SWITCHBOARD supplied to a large tyre manufacturer.

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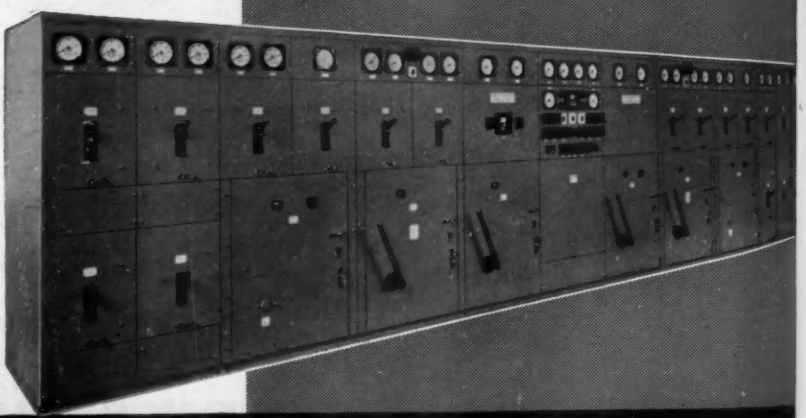
A D/C CUBICLE TYPE SWITCHBOARD equipped with withdrawable D/C breakers, as supplied to Harbour Boards, Steelworks and Atomic Power Stations.

ALL A/C BREAKERS ARE CERTIFIED IN ACCORDANCE WITH B.S.S. 116 & 936 for 25 and 31 M.V.A. at 400 volts.



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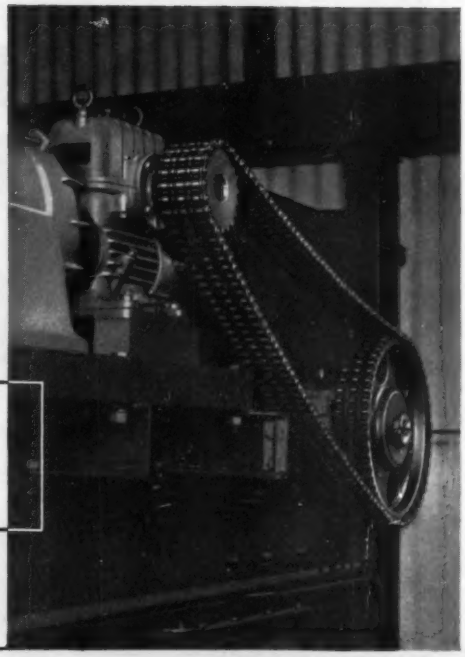
SWITCHGEAR SPECIALISTS | CASTLETON ROCHDALE LANCS

## A LONG RUN FOR YOUR MONEY

For conversions or new equipment specify **RENOLD stock chain drives.** Quiet, positive and smooth running, they will give you years of dependable, trouble-free service, outlasting other types of transmission many times.

Drives from fractional to 140 h.p. can be supplied **FROM STOCK** in 25 different ratios, easily selected from chart in our Catalogue Ref. 116/93

**RENOLD** **STOCK CHAIN DRIVES**



Handling quarry stone is heavy work, but this robust Renold stock chain drive will keep the conveyor working without breakdown despite continuous heavy and shock loads.

RENOLD—*the FIRST name in precision chain*

RENOLD CHAINS LIMITED · MANCHESTER

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OIL FILLED RADIATORS

GRUBB ENGINEERING CO. LTD.,
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TUBULAR HEATERS
STANDARD & WATERPROOF
in sizes from 2ft. to 12ft.

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for quality of manufacture you cannot obtain better heaters at the price

'WAFER' CONVECTOR HEATERS

These robust popular wall mounted Heaters can be obtained from stock at any of our 25 Branches in 1 and 2 kw sizes.
*500, 750 and 1500 watt are also manufactured.*
With or without on/off Switch. Also with 3 Heat Switch.
Standard colour: Bronze.
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*One of our Sales Engineers would be glad to call on you by arrangement.*

**SIEMENS EDISON SWAN LTD.** *An A.E.I. Company*
38-39 Upper Thames Street, London, E.C.4. *25 Branches throughout the country.*

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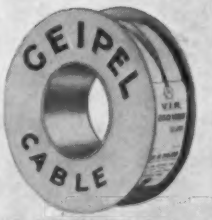
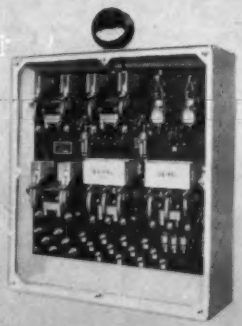
RUBBER & THERMOPLASTIC CABLE




TO BRITISH STANDARD SPECIFICATIONS



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Standard and Special Equipment

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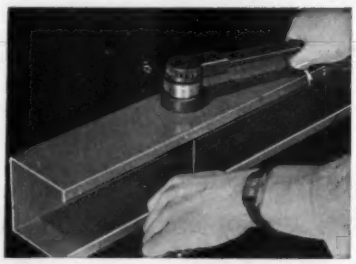

You should try the DAVIS 'QUICK PUNCH' *Pat. No. 748028.*

A Portable press tool for punching holes up to 2"

SEE THIS DEMONSTRATED ON OUR STAND L10 AT THE ASEE EXHIBITION

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*MAKERS OF QUICK-FIX CABLE TRUNKING*
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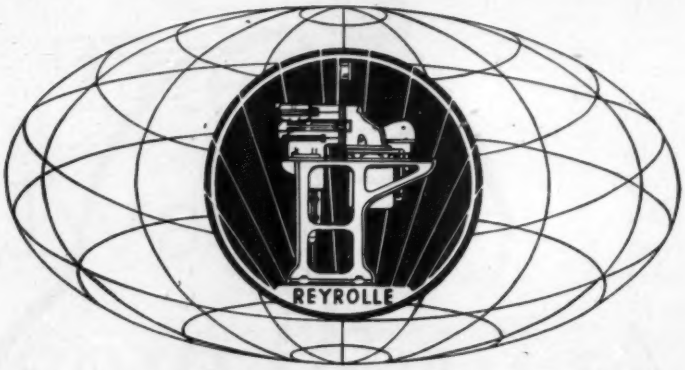


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*Manufacturers of:*

AIR-BLAST SWITCHGEAR

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ELECTRICAL ACCESSORIES

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# ...products with *pedigrees*...

I'm a family man Tim Tapir says,
And the family's growing fast,
For we've stood the test,
With only the best
Of quality first and last.

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**THERE'S SOMETHING TO INTEREST YOU**

—whether you're concerned with electronics or electric fires. For in addition to their long tradition and experience in street-lighting, industrial lighting, switchgear, fans, cookers and all home appliances, Revo have something new to offer in the field of electronic equipment.

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***You are invited . . .***

to discuss your own problems, as well as Revo products, with the team of Revo experts on the stand. So come to Stand H.9. You'll be welcomed!

**ELECTRICAL ENGINEERS EXHIBITION, Earls Court, London | March 25 to March 29**

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Illustrated above is a selection from
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## MODERN LIGHTING FITTINGS

MADE IN OUR OWN FACTORY IN LONDON

and now on view in our

## EDEN GROVE SHOWROOMS

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MANUFACTURERS OF FLUORESCENT & GENERAL LIGHTING EQUIPMENT

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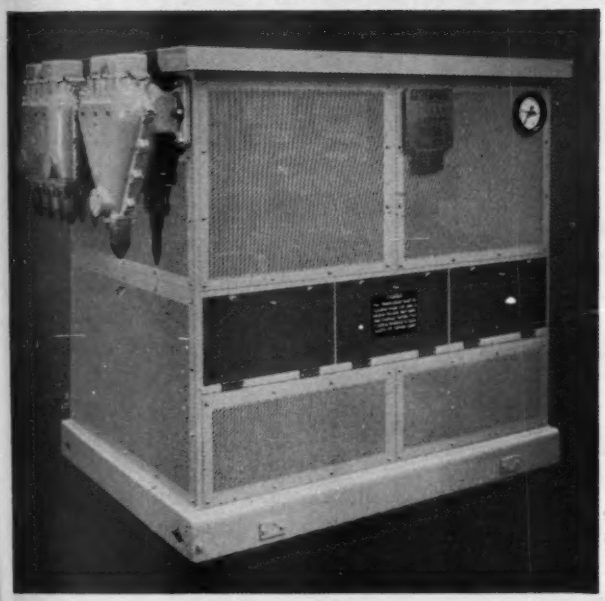
* **No fire or explosion risk**
* **Reduced maintenance**
* **Frequent overloading permissible**
* **Smaller size and weight than O.N. or Class B units**
* **Dust, humidity and ventilation are no problem**
* **Can be placed at load centre, therefore making shorter low-voltage cable runs possible.**

*The photograph below shows a 500kVA Ferranti dry-type, air-cooled distribution transformer with Class 'C' silicone insulation — B.S.2757 : 1956.*



MS

**Silicone insulated dry-type transformers ARE SAFER!**

Here is a list of well-known British manufacturers producing silicone-insulated dry-type transformers for the United Kingdom and overseas. These transformers have been installed in:

*Steel mills · Car factories*
*Newspaper plants · Food factories*
*Flour mills · Coal mines*
*Underground sub-stations*
*Office buildings · Blocks of flats*
*Departmental stores*
*Radar and airfield sites*

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*(Associated with Albright & Wilson Ltd. and Dow Corning Corporation)*

**first** *in British Silicones*

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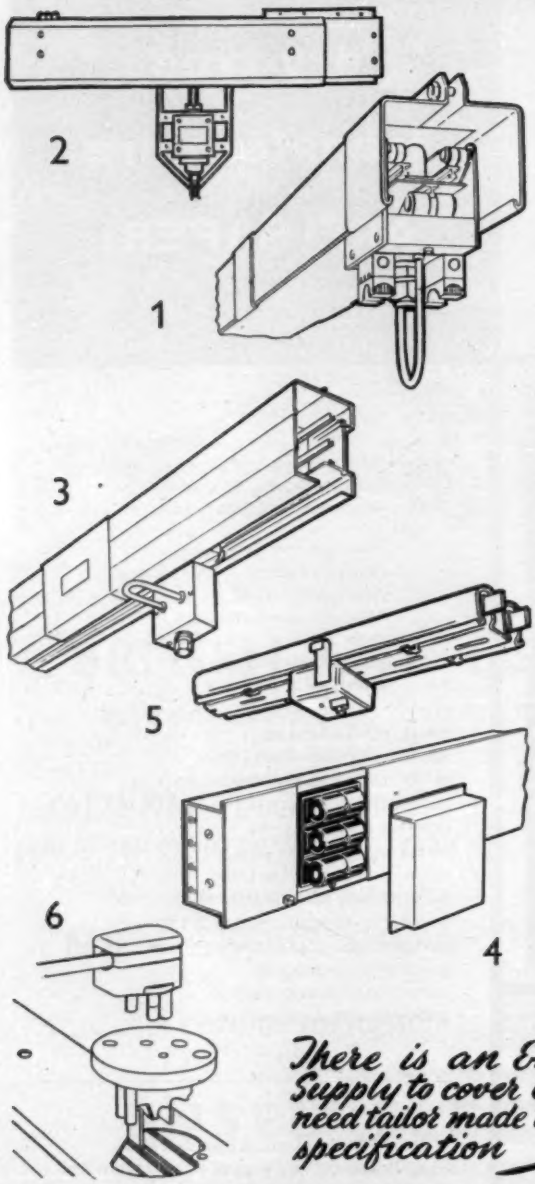
Midland Silicones Limited manufacture in Great Britain the full range of silicone resins and elastomers used by transformer manufacturers in the construction of silicone-insulated dry-type units.

# MECHANICAL HANDLING

## NEEDS SAFE MOBILE POWER SUPPLIES




**1. "TROLLEY DUCT"**

**2. "TROLLEY MASTER"**

**3. "UNIDUCT"**
enclosed conductor track systems for single and 3 phase mobile power supplies.

**4. "MINIBUS"**
Miniature busbar system for machine shops.

**5. "MINIPLUG"**
Plug-in distribution system for lighting and small single phase power applications.

**6. "PLUGBUS"**
a plug-in busbar system of 13 amp. plugs and sockets for laboratories, small assembly plants, office machines etc.

**SPECIALS**
We design and make all types of factory distribution systems to customers' special requirements.

*There is an E.M.S. Power Supply to cover every industrial need tailor made to your own specification*

Meet us at **STAND FI2**
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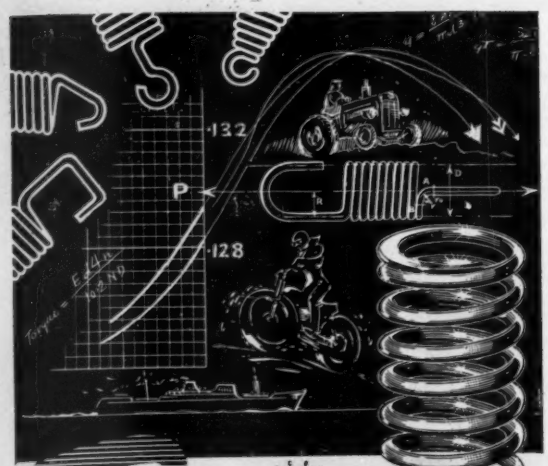


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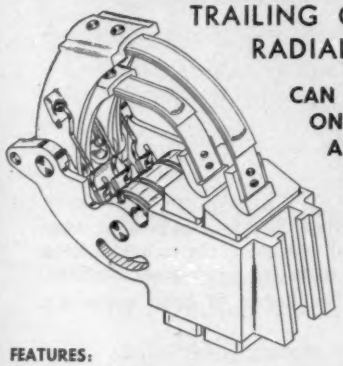

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**CAPACITIES:** EL.2A $\frac{3}{8}$" to 1" screwing and open seam conduit.
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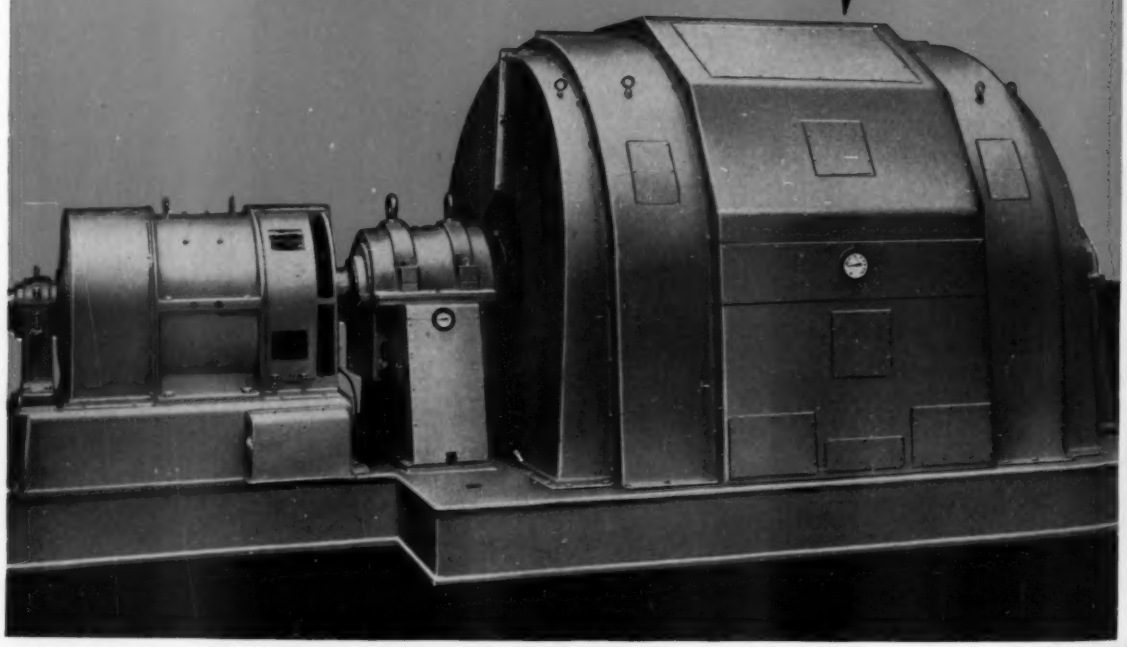

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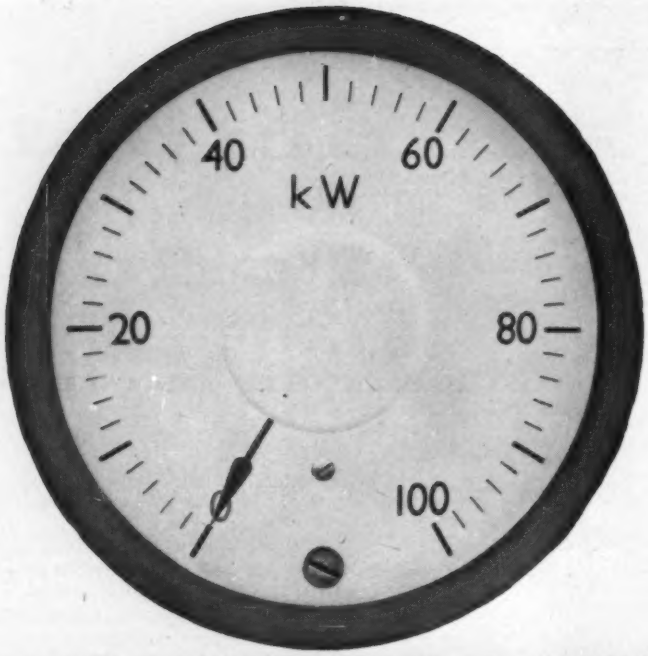


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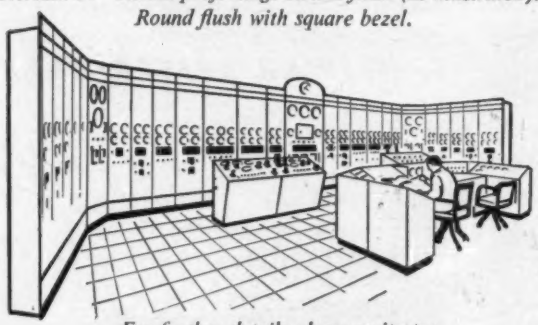

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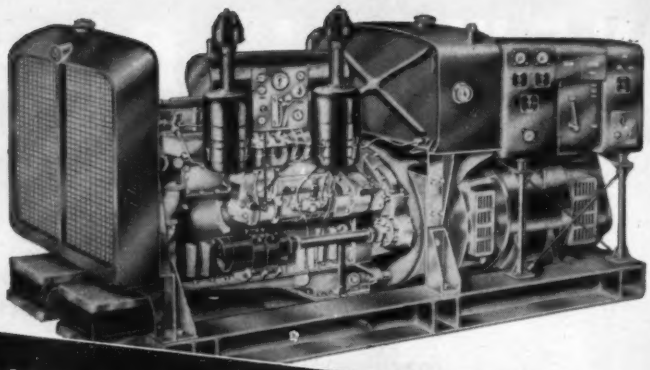

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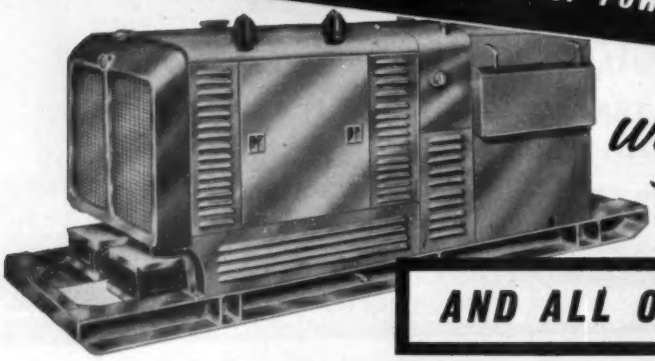

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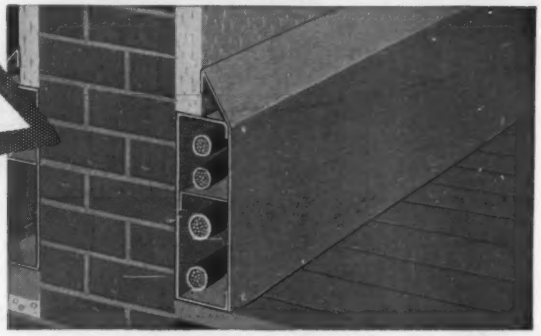

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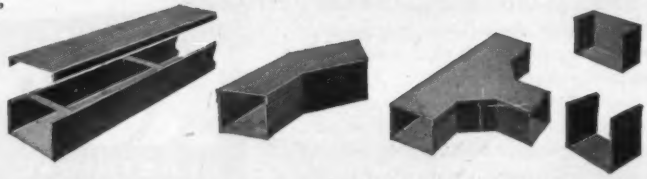

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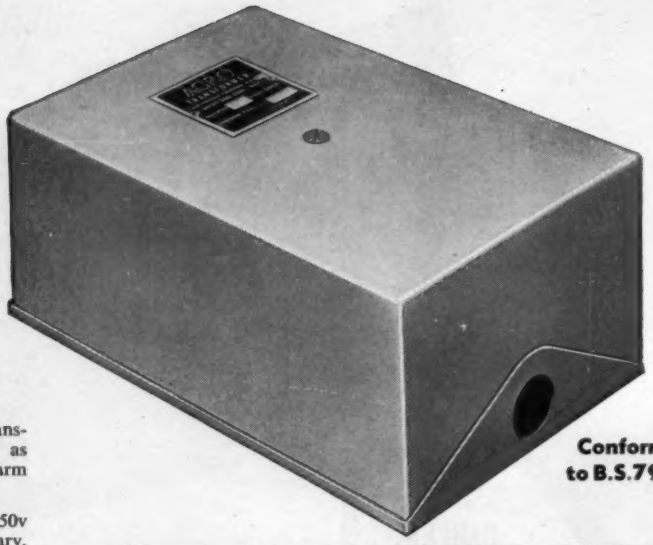
AP378

# The AGRO *low voltage transformer*



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The primary is wound for connection to 200/250v single phase A.C. supplies. The secondary, which gives a continuously rated output of 50Va, is available in three alternative windings as follows :

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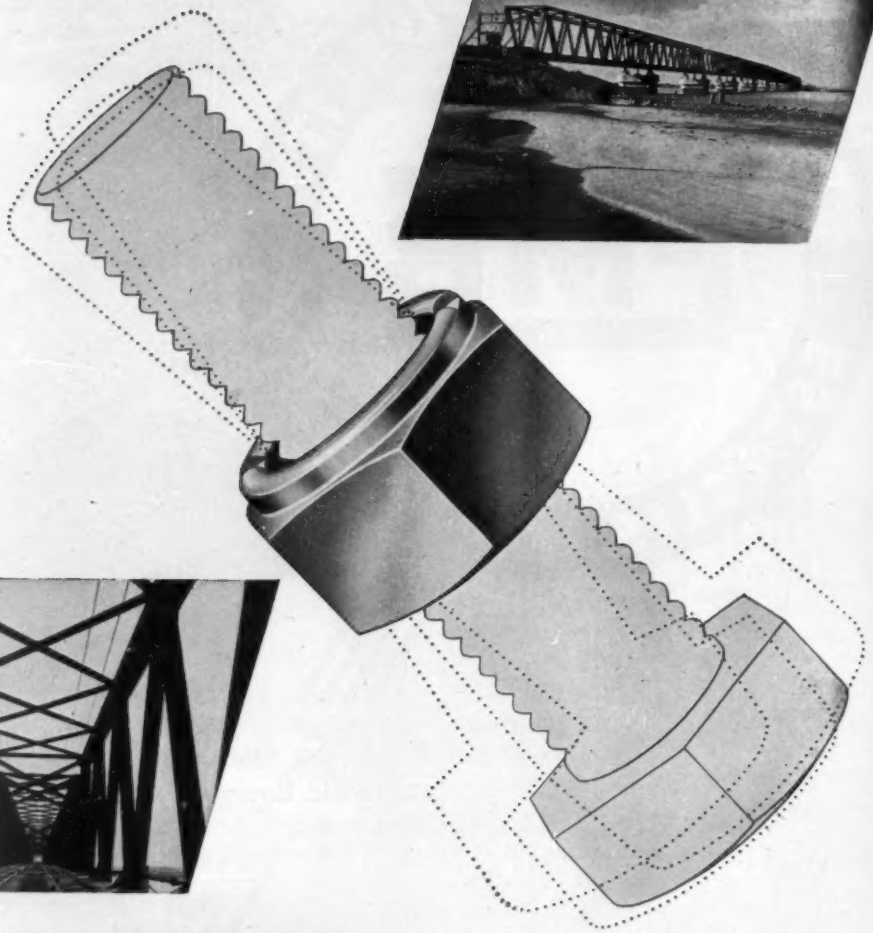

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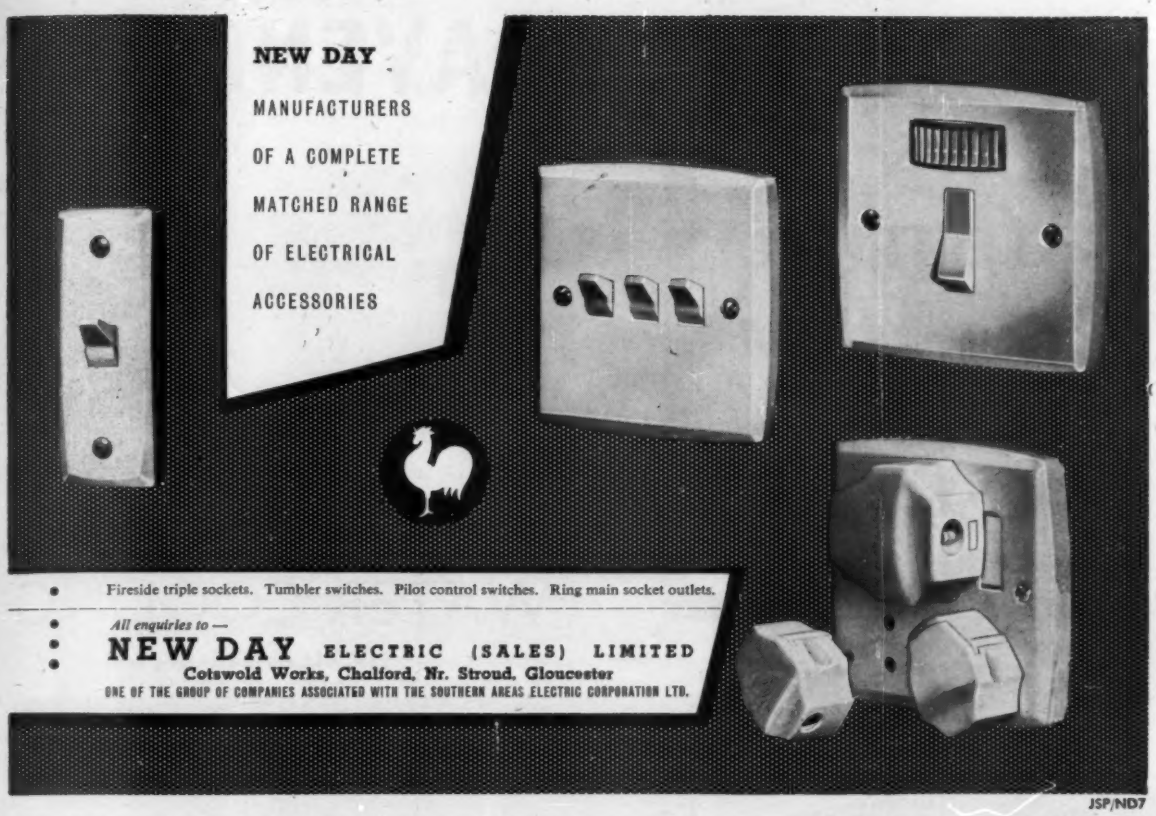


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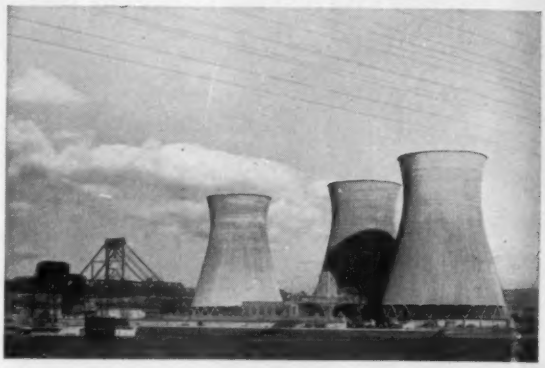

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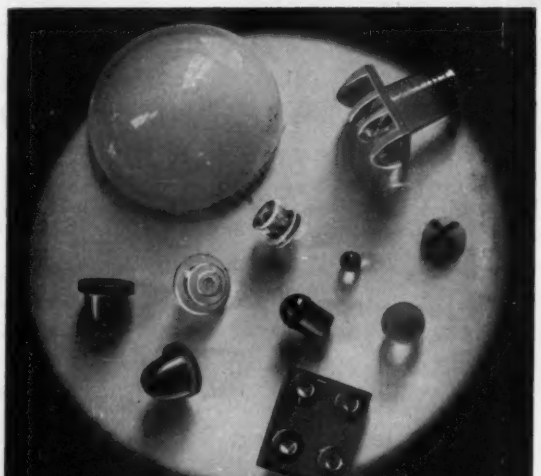

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STAND No. K.7
ELECTRICAL ENGINEERS EXHIBITION
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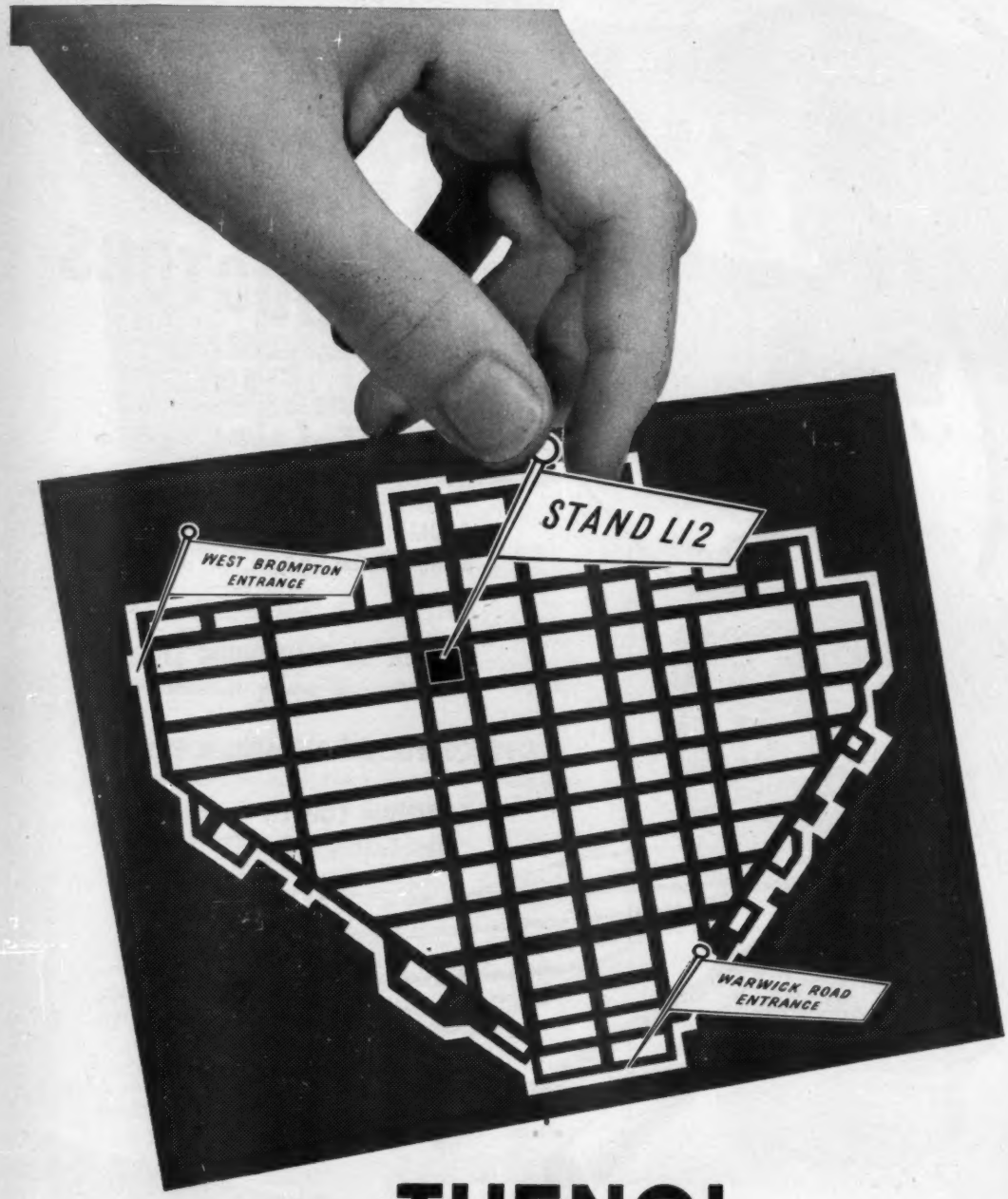


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337

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**COPPER WIRE**
plain or tinned, cotton, paper or asbestos covered.

**ALUMINIUM WIRE AND STRIP**
plain, cotton, paper or asbestos covered.

**COPPER OR ALUMINIUM STRAND**
for overhead power transmission.

**COPPER OR ALUMINIUM BUSBARS**

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*Also* K *for* ALUMINIUM ALLOY

**CONDUIT TUBING, BARS, TUBES AND SECTIONS**

*Durcilium (Regd.) Alumagnese*

**E. & E. KAYE LTD.**
PONDERS END · ENFIELD · MIDDLESEX

*Telephone..* Howard 1601
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K5

STAND NO. E.4.

ELECTRICAL ENGINEERS EXHIBITION

# SATCHWELL

## AUTOMATIC TEMPERATURE CONTROLS

### ELECTRIC COOKING

New range of Satchwell Superswitches for infinite regulation of heat input to hotplates. Thermostats of various types for controlling domestic and industrial ovens.

### ELECTRIC WATER HEATING

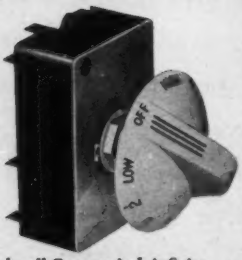
A range of Satchwell thermostats for controlling domestic electric storage and immersion water heaters.

### SPACE HEATING

Satchwell two-position and modulating systems for automatic control of space heating and air conditioning with weather controls, thermostats, motorised valves, and associated equipment. Automatic controls and protective devices for coal, oil and gas-fired apparatus. New Instruments: "TL" Room thermostat and "PA" clamp-on pipe thermostat.

### INDUSTRIAL PROCESSES

A range of industrial thermostats, two-position and modulating throttling, mixing and diverting valves for steam, hot water and other liquids and gases.




*Satchwell Superswitch infinite control for boiling plates*

*Satchwell VK water heater thermostat for pre-set or variable operation*

*Satchwell TL room thermostat*

SATCHWELL

THE RHEOSTATIC CO. LTD.

SLOUGH - BUCKS

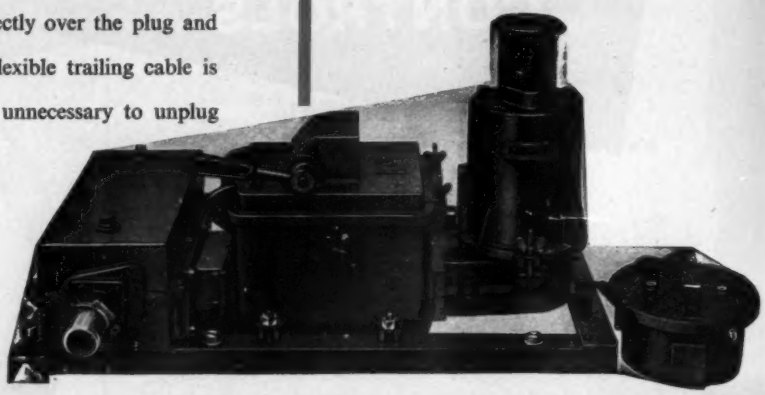
# watertight plugs and sockets

## for outdoor crane work

**There are several arrangements of Weekes' w/t plugs and sockets, one of the modified forms being that designed for use with a travelling crane.**

THE travelling crane passes directly over the plug and socket, and the slack in the flexible trailing cable is wound on a drum, thus making it unnecessary to unplug and reconnect when the crane passes the plug point. The plug and socket swing through a maximum angle of 220°.

All designs of Weekes' watertight plugs and sockets can be made in ratings up to 300 amps, 500 volts, with two, three or four contact pins.



THIS DOCK PLUG IS FOR INSTALLATION IN A PIT, OR ON GROUND LEVEL

***Also for use with excavators, floating docks, electro-magnets and electric furnaces.***

*Advise us of your requirements: we can probably meet every one of them.*

**Our watertight plugs and sockets have been supplied to docks and harbour boards, both in this country and abroad, some of which are shown below:**

- *Ayr*
- *Canada*
- *Ceylon*
- *Dartford*
- *Denmark*
- *Devonport*
- *Durban*
- *Falmouth*
- *Finland*
- *Fleetwood*
- *Garston*
- *Gibraltar*
- *Hebburn-on-Tyne*
- *Hong Kong*
- *Malta*
- *Milford Haven*
- *New Zealand*
- *Mormagao, India*
- *Norway*
- *Pembroke Dock*
- *Portsmouth*
- *Preston*
- *Rangoon*
- *Sheerness*
- *Sydney, Australia*
- *Singapore*
- *South Africa*
- *Southampton*
- *Swanscombe*
- *Trinidad*
- *Veraval, India*

**L. WEEKES (LUTON) LIMITED**

**WINGATE ROAD, LUTON**
**Bedfordshire, England**

*Telephone: LUTON 278*

*Aberdare Cables used by the China Light & Power Co. Ltd., Hong Kong.*

# A World Apart
# Aberdare Cables
# serve East and West

Throughout the world, in industry and in public utilities, Aberdare Cables have built up a reputation for service and reliability.

The following types are in regular production:—

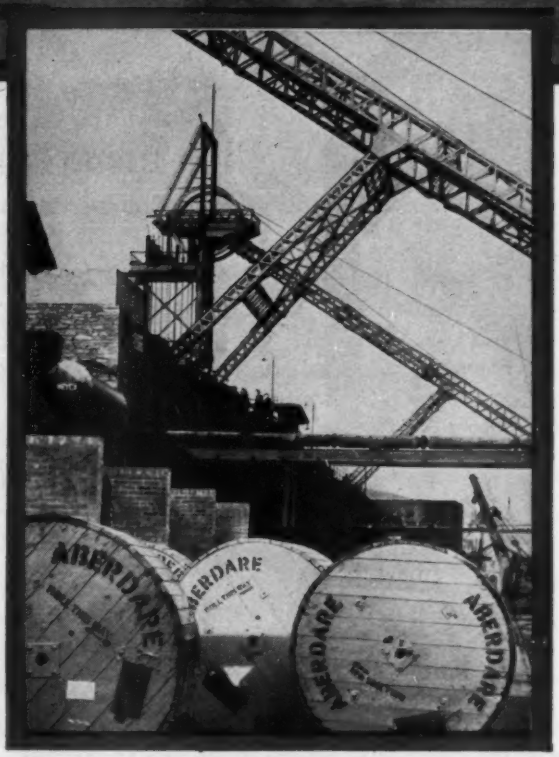
*Paper insulated power cables for working voltages up to 33 kV manufactured to British Standard or foreign specifications, with copper or alternatively aluminium conductors.*

*Mass impregnated non draining paper insulated lead covered cable.*

*Corrosion resistant P.V.C. sheathed paper insulated lead covered cables.*

*Cambric insulated cables.*

*Multicore cables for railway signalling control and telephone circuits.*




*For installation in a South Wales Colliery.*

Aberdare Cables

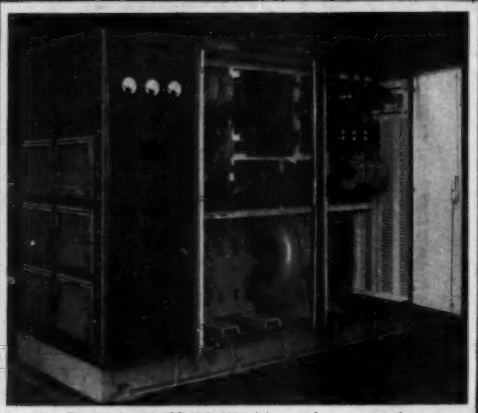
ABERDARE CABLES LTD., ABERDARE, GLAMORGAN. ABERDARE 416. LONDON OFFICE: NINETEEN WOBURN PLACE, W.C.1. TERMINUS 2777

# VARIABLE SPEED *PACKAGE* DRIVES

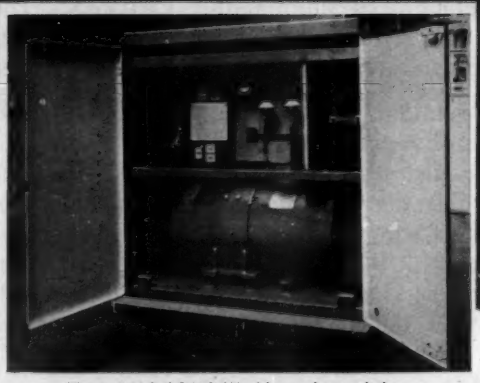
by

E C C

Illustrated are the main calender, cooling drum and wind-up power units for a tyre fabric process line



The packaged 100 H.P. Ward Leonard set to supply the main calender motor.
Dimensions 118" W. × 86" H. × 51" D.



The packaged 10 B.H.P. Ward Leonard set and electronic gear for synchronising the 5 B.H.P. cooling drums and 5 B.H.P. wind-up drives with the main calender
Dimensions 50" W. × 50" H. × 28" D

**SEVEN STAR FEATURES**

- ★ Saves floor space
- ★ Reduces site wiring to a minimum
- ★ Eliminates special foundations
- ★ Cubicle pressurised with filtered air
- ★ Easily maintained
- ★ Electronic Control incorporated where required
- ★ Tailored to suit your individual needs

**Our specialist engineers will be glad to advise on the best method of control for YOUR drives.**

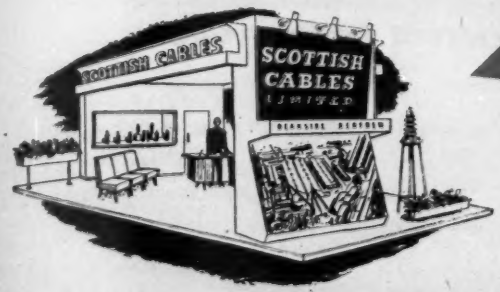
**THE ELECTRIC CONSTRUCTION COMPANY LIMITED**
**WOLVERHAMPTON**

3303

# SCOTTISH CABLES LIMITED

ELECTRICAL ENGINEERS (A.S.E.E.) EXHIBITION 1958

*invite you to visit . . .*




## STAND No. D.2

*at the*

**ELECTRICAL ENGINEERS (A.S.E.E.) EXHIBITION**

EARLS COURT LONDON

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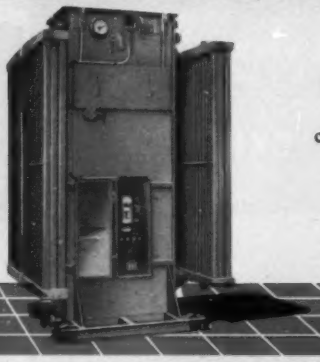
DEANSIDE • RENFREW • SCOTLAND

LONDON OFFICE • BUSH HOUSE • ALDWYCH, W.C.2

*Associated Company:* SCOTTISH CABLES (SOUTH AFRICA) LTD. PIETERMARITZBURG, NATAL

# FOR POWER CONTROL & REGULATION *you can rely upon*

## BRENTFORD'S 21 YEARS' EXPERIENCE



### Brentford Regulators

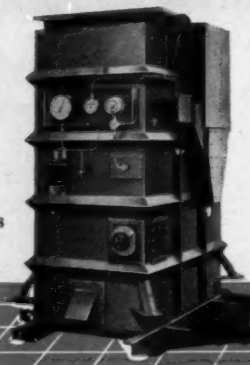
*for overseas supply schemes*

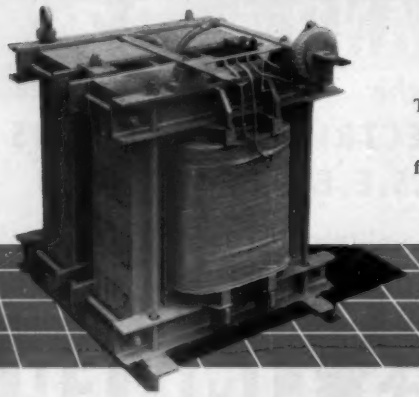
The illustration shows a Brentford Regulator completed for a power corporation. This regulating unit is for use in high voltage distribution line which stabilizes the output voltage automatically at 25,000. Variations of up to ± 10 per cent. are controlled and the unit also compensates for the voltage lost in the distribution line. The equipment has a throughput of 3,270 kVA, operating on a 3-phase, 60-cycle, 25,000 volt system.

### Brentford 'Class H' Transformers

*where safety is imperative*

Brentford Safety Green Seal Transformers using 'class h' insulation — glass, ceramics and other inorganic dielectric materials impregnated with silicone resins — give longer service life and being fire, explosion and damp proof, they are the safest transformers ever developed. Where special safety precautions are called for, the unit is supplied in sealed tank filled with nitrogen, as shown.





### Brentford Transductors

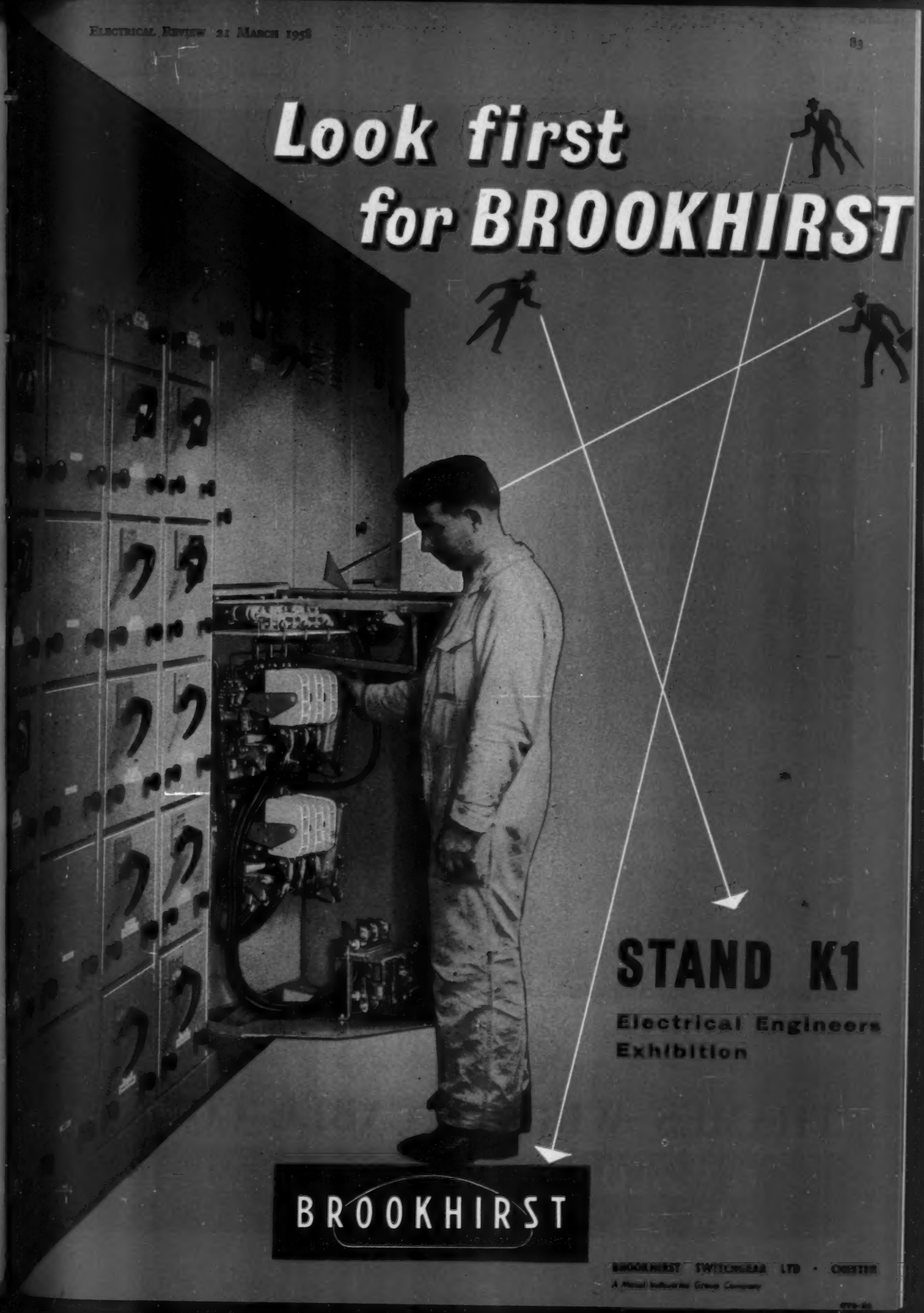
*an alternative method of voltage control*

These Transductors supplement our well-known Voltage Regulators. The Transductor illustrated is rated for 35 kVA and is designed to control furnace temperature. Manual adjustment of the voltage is obtained by a rheostat, alternatively automatic control can be arranged.

*Specify* **BRENTFORD**

**TRANSFORMERS and REGULATORS**

*BRENTFORD TRANSFORMERS LTD · MANOR ROYAL · CRAWLEY · SUSSEX · Telephone: Crawley 25121*



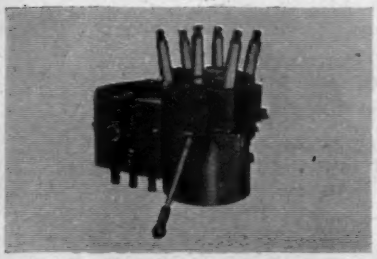

BROOKHIRST SWITCHGEAR LTD · CHESTER
A Metal Industries Group Company

An Artist's impression of our works

# THAMES WIRE & CABLE CO. LTD.

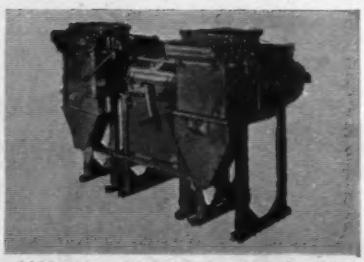
**BREWERY ROAD, HODDESDON, HERTS**

*'Grams:* Thames, Hoddesdon *'Phone:* Hoddesdon 3731

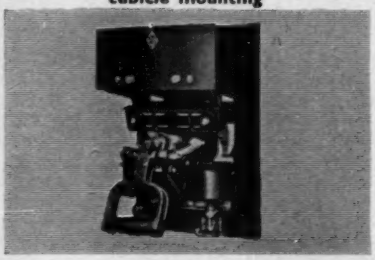


15 kV Oil Circuit Breaker for cubicle mounting

Heavy Current D.C. Circuit Breaker and Knife Switch Panel

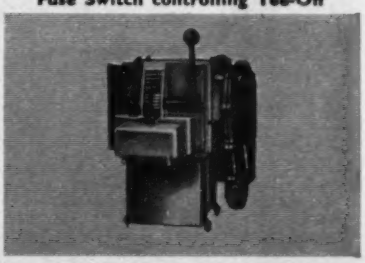


H.V. Ring Main Switchboard with Fuse Switch controlling Tee-Off

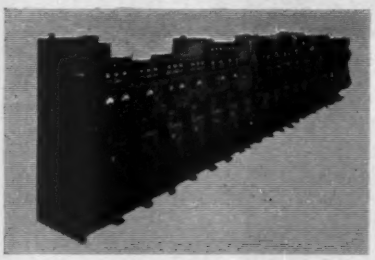


Small Air Circuit Breaker

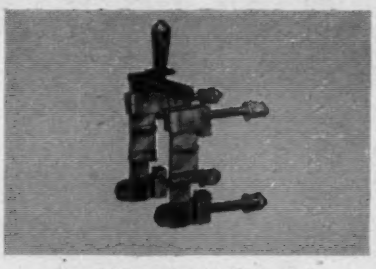
Ammeter and Voltmeter Switches



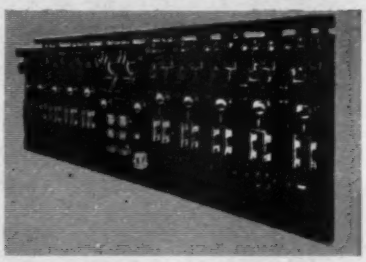
L.V. Industrial Oil Circuit Breaker



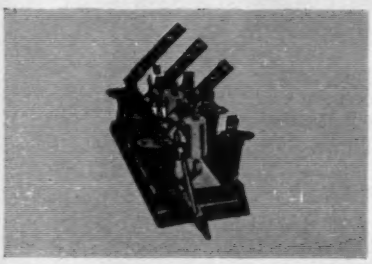
11 kV Metalclad Switchboard



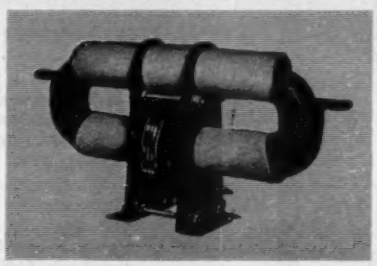
Panel Mounting Knife Switch



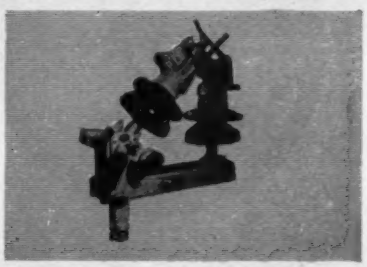
D.C. Switchboard for Steel Works



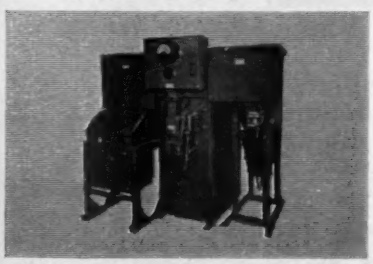
T.P. 11 kV Isolating Switch



Current Transformers



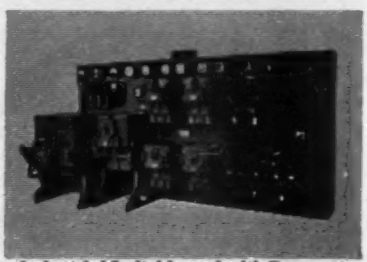
Outdoor Pole Mounting Isolators



H.V. Switchboard incorporating Automatic Fuse Switch

STATTER

***Specialists in Switchgear for over 50 Years***



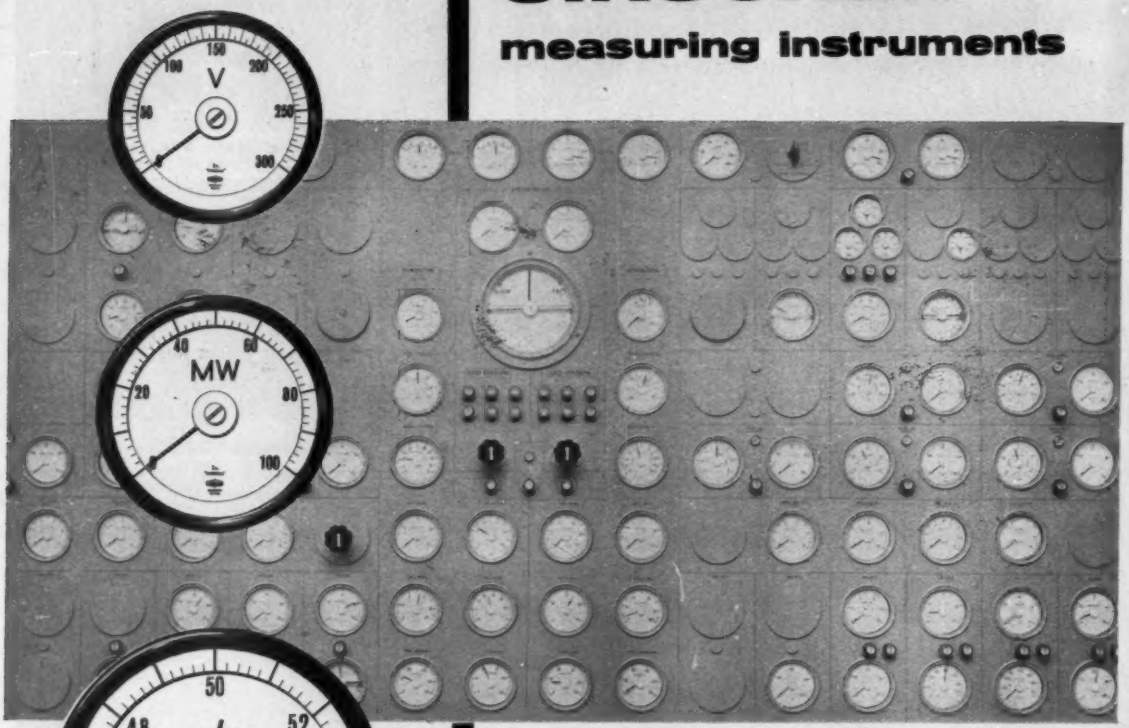
Industrial Switchboard with Drawout Oil Circuit Breakers

**J. G. STATTER & CO. LTD**

**82 VICTORIA ST. LONDON SWI**

# CIRSCALE

## measuring instruments




### POWER USERS

Whether your demand is in Megawatts or Kilowatts, an accurate knowledge of your loading and supply conditions is essential. "Cirscale" Indicators are available as:-

Ammeters,
Voltmeters,
Wattmeters,
Varmeters,
Power Factor Indicators,
Frequency Indicators,

in a wide range of sizes in contemporary styling as illustrated.

VISIT US AT
EARLS COURT
ELECTRICAL ENGINEERS
A.S.E.E.
EXHIBITION
MARCH 25th to 29th 1958
STAND No. B.9

**Widely used by C.E.G.B. and other Supply Authorities, and by many leading industrial concerns for a good reason — dependability!**

RECORD

**THE RECORD ELECTRICAL CO. LTD**

"Cirscale" Works, Broadheath, Altrincham, Cheshire.

Offices at: Belfast, Birmingham, Bristol, Dublin, Glasgow, Leeds, London.

C 9144

H.M.T.S "MONARCH"

# The Transatlantic Telephone Cable

*"In every phase of this combined operation use has been made of the best that was available for the job . . . "*

*"Construction of the Repeaters on both sides of the Atlantic, aimed at achieving as near perfection as humanly possible: if one of them fails, communication will stop . . . "*

*Sir Gordon Radley, K.C.B., C.B.E., Ph.D.(Eng.), M.I.E.E.*
*Director General, United Kingdom Post Office.*

*Photograph by courtesy of Standard Telephones and Cables Ltd.*

*Covered by British, Foreign Pats. and Reg. Designs, etc. Complying with leading countries' electrical standards.*

THE 16 Submerged Repeaters in the Transatlantic Telephone submarine cable section between Newfoundland and Nova Scotia had to be built to withstand the rigours of laying and water pressure at depths of up to 250 fathoms under the Atlantic, with components of such fidelity as to last many years without attention.

Each Repeater contains 299 separate components and required 1,950 SOLDERED JOINTS to connect them together and each joint was inspected at some stage of production and marked to indicate that it had been inspected and accepted.

The Repeaters for the Clarenville to Sydney Mines cable were made in the Standard Telephones and Cables factory at Woolwich, London.

High fidelity in components, skill and craftsmanship was well matched with—

ADCOLA

## SOLDERING EQUIPMENT

*Write for Catalogues*
HEAD OFFICE AND SALES

**ADCOLA PRODUCTS LTD.**
Gauden Road, Clapham High Street, London, S.W.4
*Telephone: MACaulay 3101—4272*

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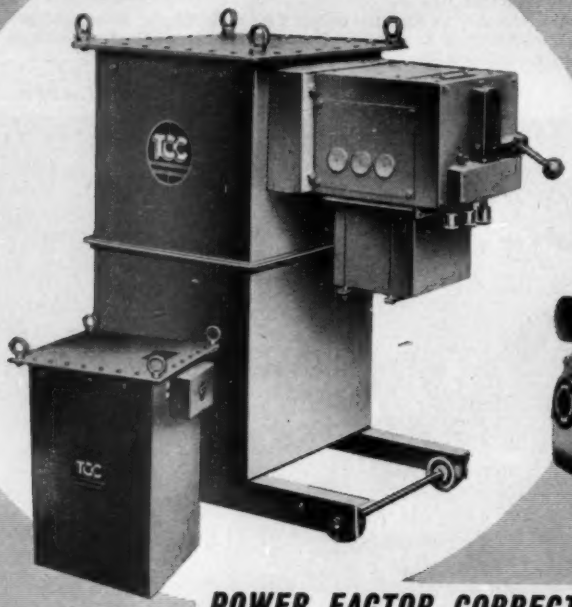
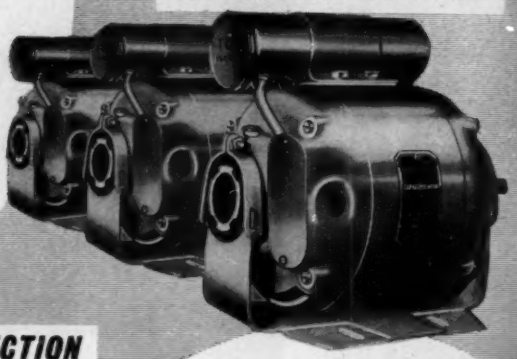
# CONDENSERS

*for all*

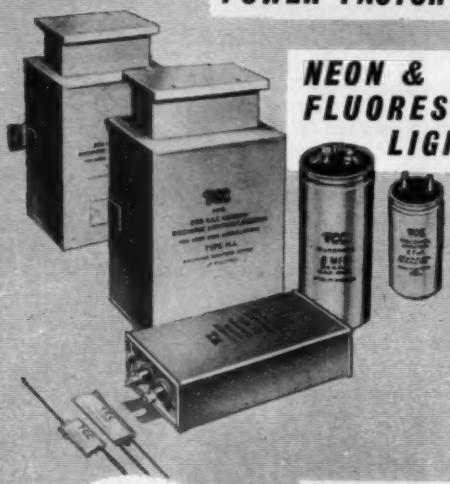
**INDUSTRIAL PURPOSES**



***A.C. MOTOR STARTING***



***POWER FACTOR CORRECTION***



***NEON & FLUORESCENT LIGHTING***

***CAR AND AERO IGNITION INTERFERENCE SUPPRESSION***

*CONDENSER SPECIALISTS FOR OVER 50 YEARS*

**THE TELEGRAPH CONDENSER CO. LTD**

INDUSTRIAL DIVISION · NORTH ACTON · LONDON W.3 · Telephone · ACOrn 4866

# The NEW JACKSON 'JOY'

*with the*

# eye level grill

**IS RIGHT ON TOP!**

*A top level cooker for top level cooks.*

*Note these selling points :*

Independently controlled Eye-Level Grill.

'Cookalone' Auto Control to oven and drawer.

3 'Speedring' Plates (8" Plate in front of the hob).

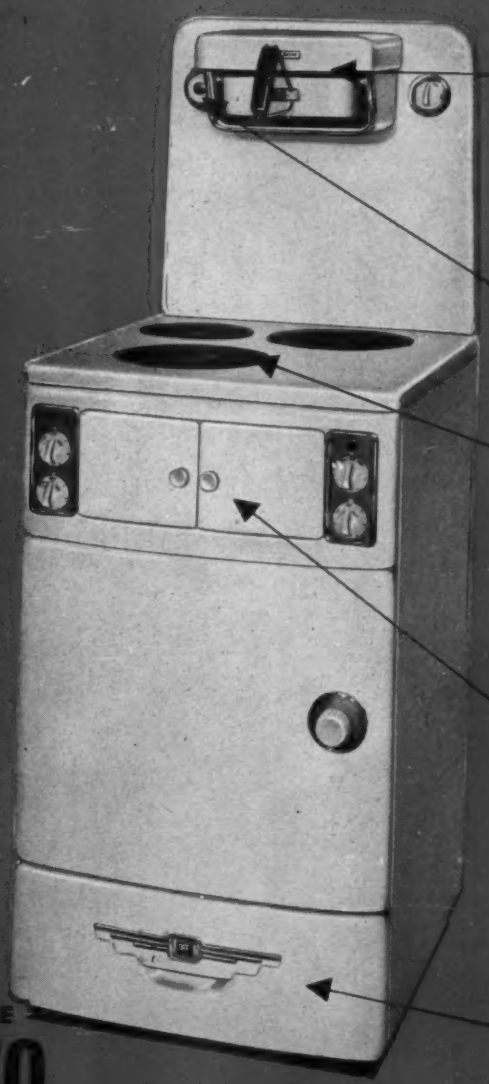
6-heat control to each plate.

Enclosed Hot Cupboard.

Wide Oven with glass door.

ON/OFF indicator to heated drawer.

FREE: Exclusive Feature! Oven roof protector using aluminium foil.



'SPATTER-FREE' EYE-LEVEL GRILL

'COOKALONE' AUTOMATIC TIME CONTROL

'SPEEDRING' PLATES with 6-heat switches

HOT CUPBOARD WITH DOORS

INDEPENDENTLY HEATED WARMING DRAWER

**Electrical Engineers Exhibition**
EARLS COURT March 25th–29th
VISIT US ON STAND R14

PRICE £70

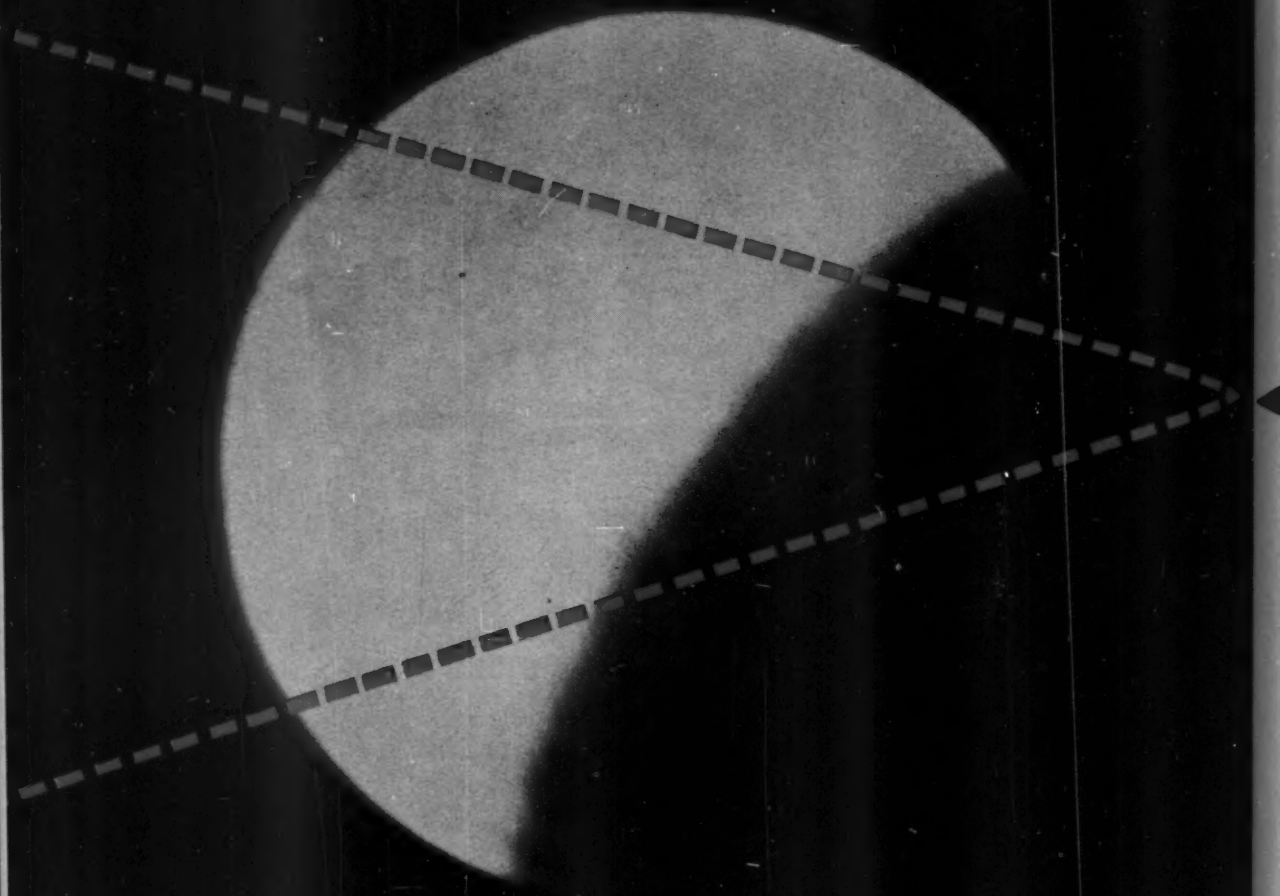
*Girdle Plate with every cooker.*

*For satisfaction— sell them* Jackson

The Jackson Electric Stove Co. Ltd., Luton, London. Branches: Belfast, Birmingham, Cardiff, Glasgow, Leeds, Liverpool, Newcastle-on-Tyne

Electrical Review 21 March 1958

# LIGHT



V
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M
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8
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# where it's wanted

VISIT US AT EARLS COURT ELECTRICAL ENGINEERS A.S.E.E. EXHIBITION MARCH 25th–29th 1958

STAND No. J.13

## with Simplex lighting equipment

**One side of the picture—**
the light we cannot alter: the light of a solar system

**And the other side of the picture—**
Electric light . . . beamed, diffused, controlled in a hundred different ways by Simplex lighting fittings: all competitively priced — sensible, modern and attractive in design. Simplex lighting specialists, with their background of 60 years' leadership, offer their help with all your lighting problems . . . from recommending the best methods and fittings, to preparing — without obligation — complete lighting layouts and estimates

## Contemporary Well Glass Luminaires

**For 60/100w GLS lamps**
Two striking new ranges of screwglass fittings here — simple and modern design. *Weatherproof, corrosion resistant,* Simplex screwglass fittings are ideal indoors or out. The two types: vitreous enamelled (acid-resistant) cast iron or cast aluminium alloy. Reflectors in pressed aluminium (optional) to suit all types. 60w complete with B.C. lampholders in bakelite — porcelain optional extra. 100w with porcelain lampholders as standard

**cut your costs with Simplex**

## Screwglass

**for 60/100w GLS lamps**

**lighting fittings by**

# Simplex

**ECLIPSE OF THE MOON**
Scientists of more than 50 nations will be observing such phenomena throughout the International Geophysical Year
*Photograph by courtesy of THE TIMES*

Simplex Electric Co Ltd Creda Works Blythe Bridge Staffs
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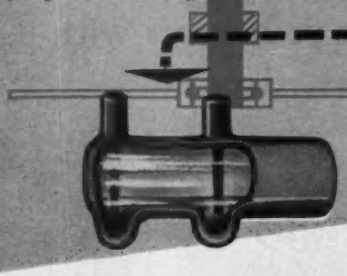

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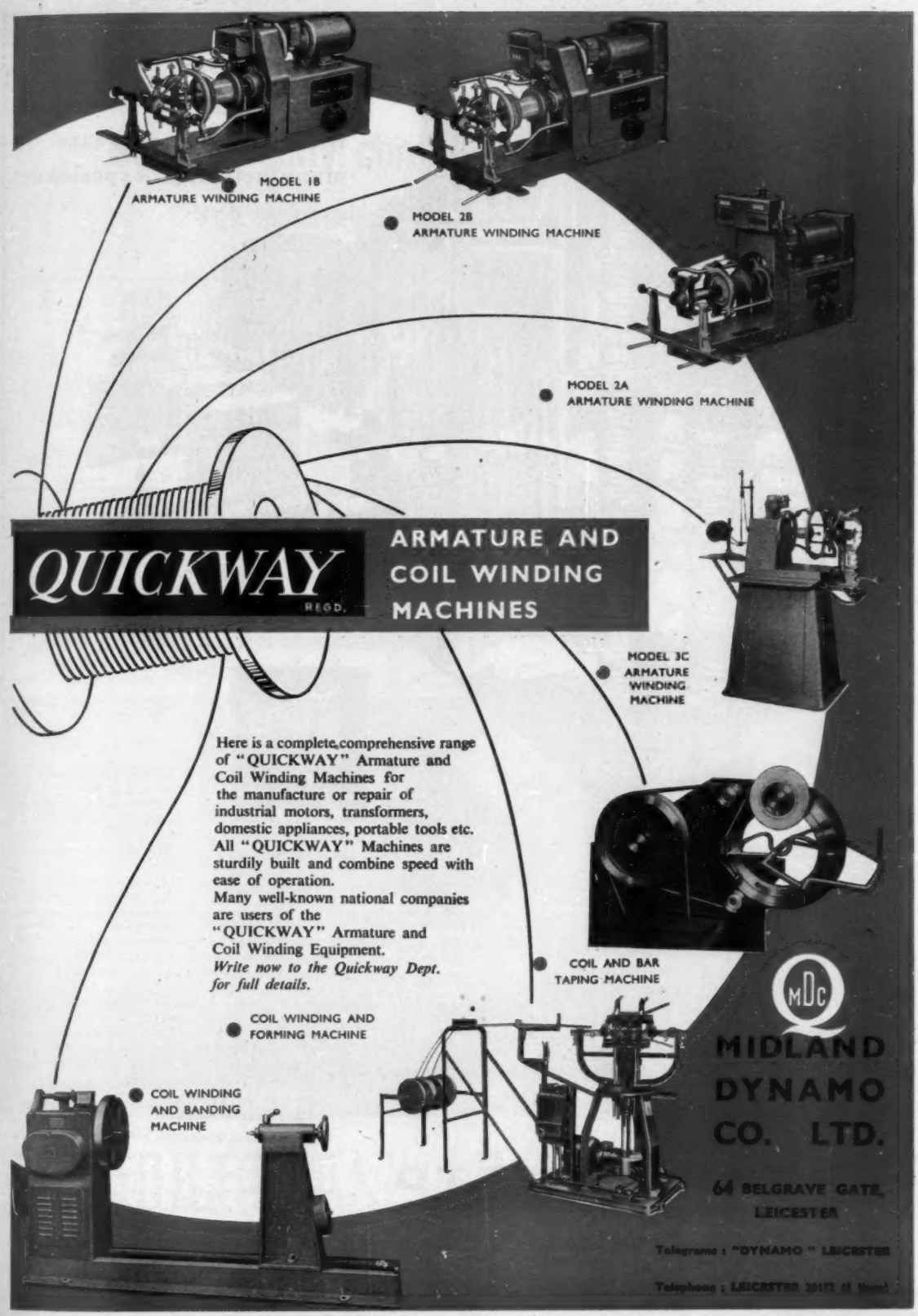
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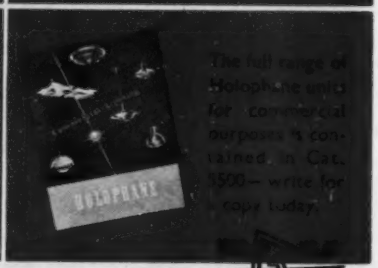

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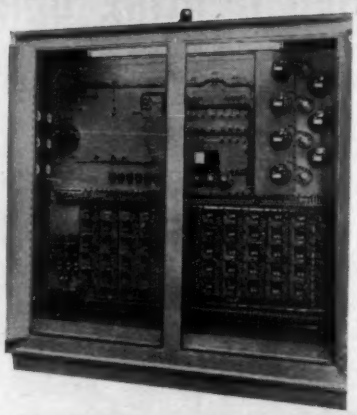

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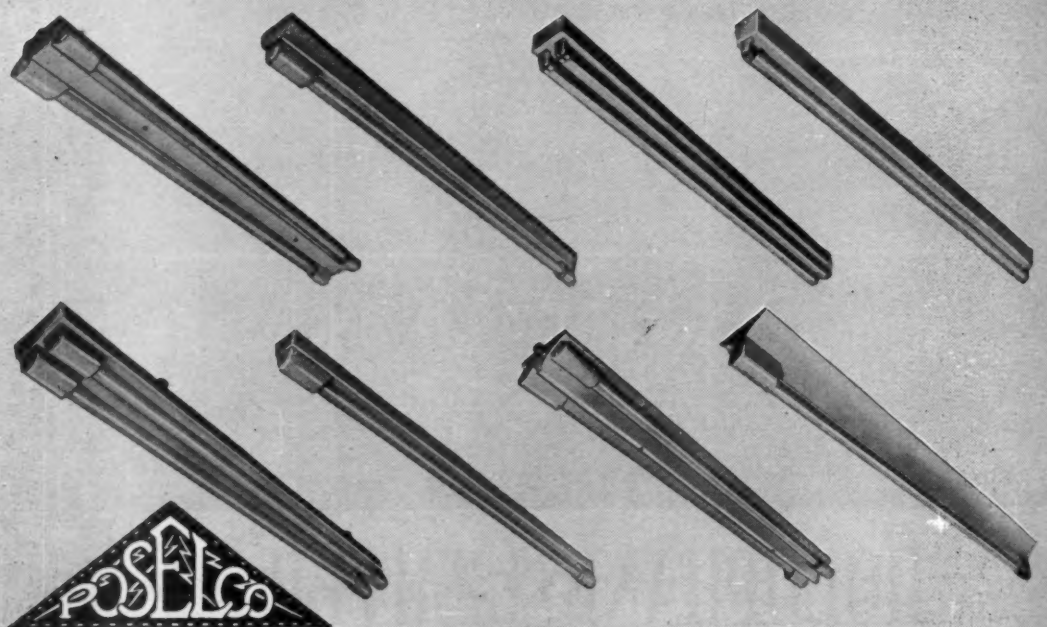

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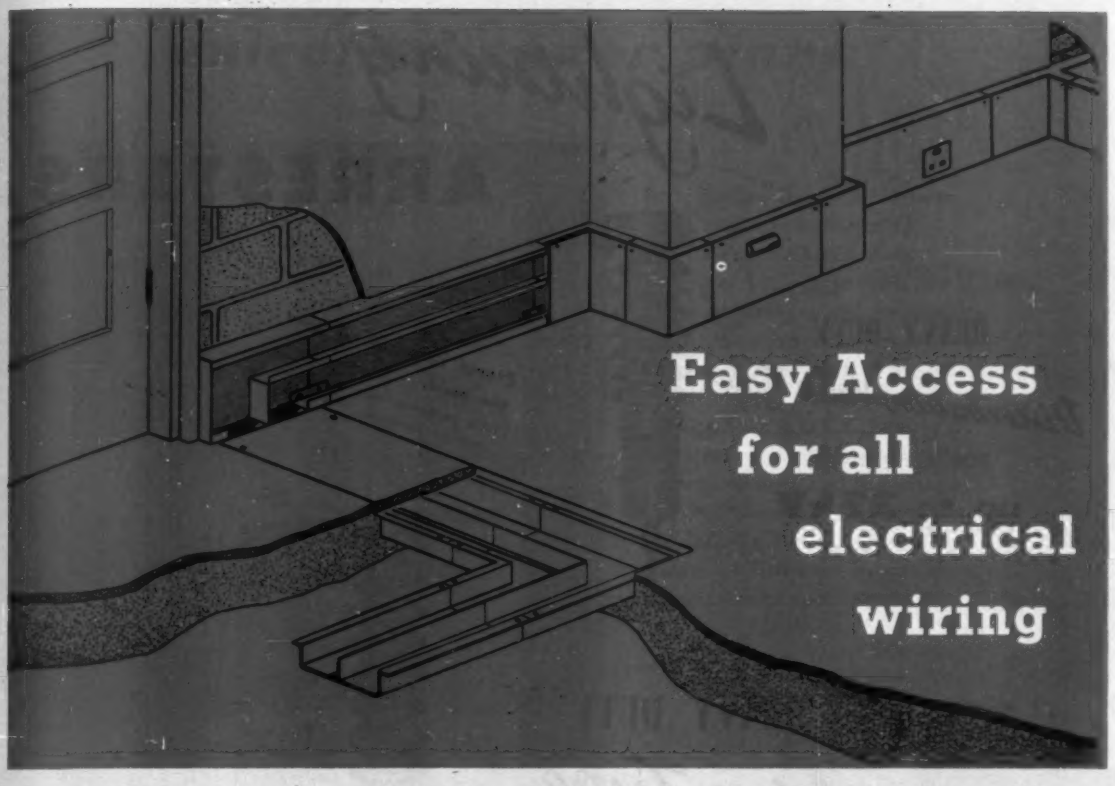


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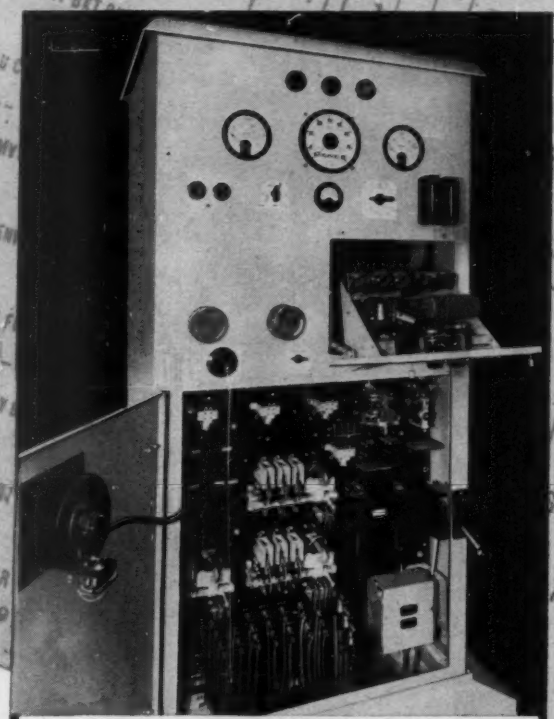

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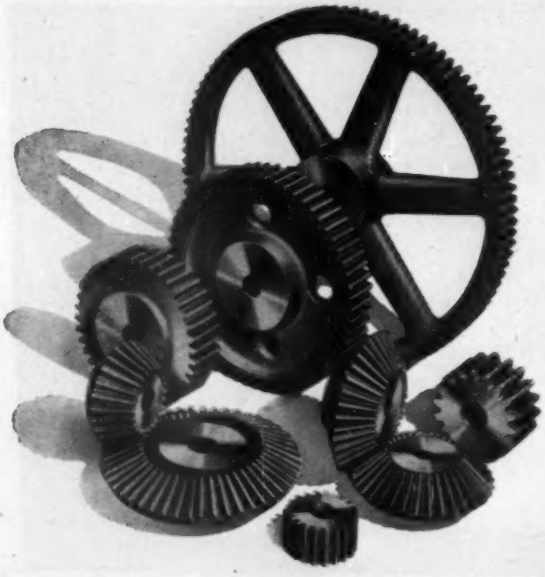

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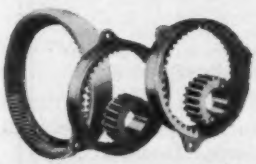

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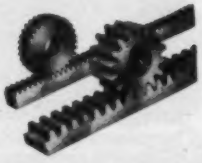

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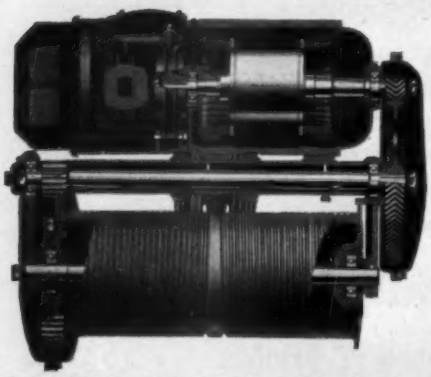

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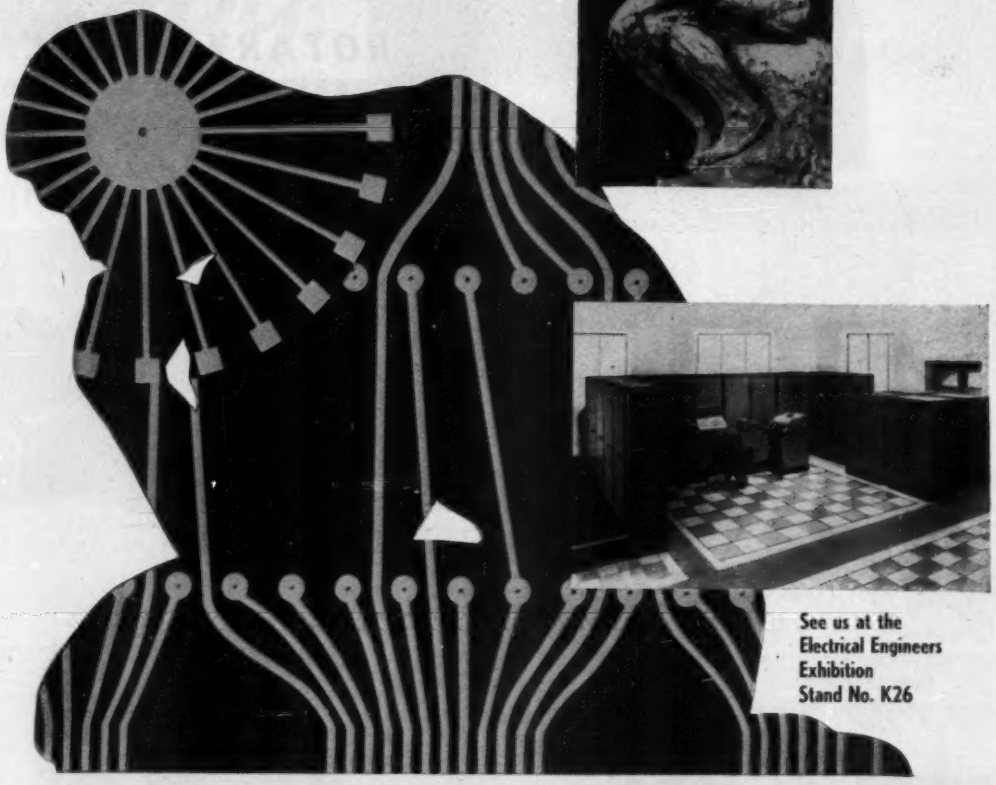

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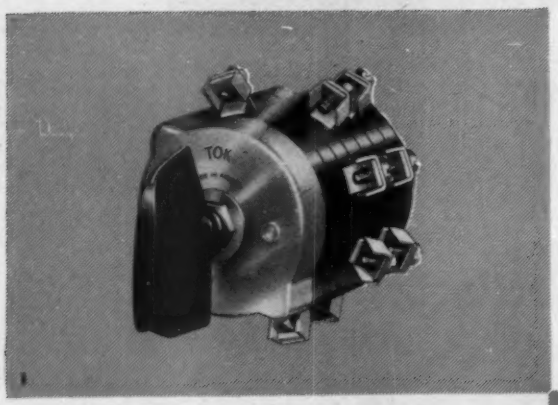

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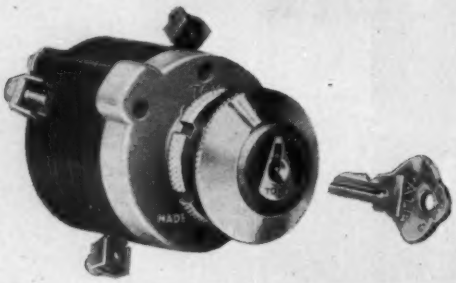

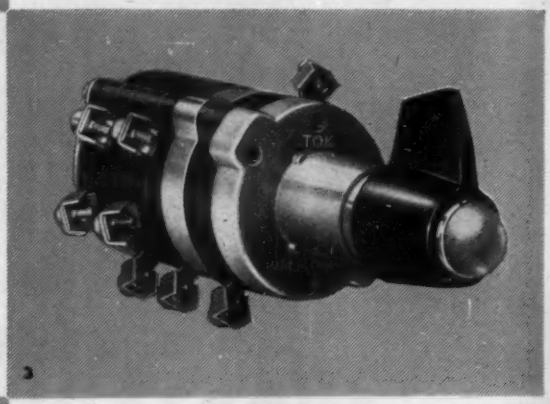

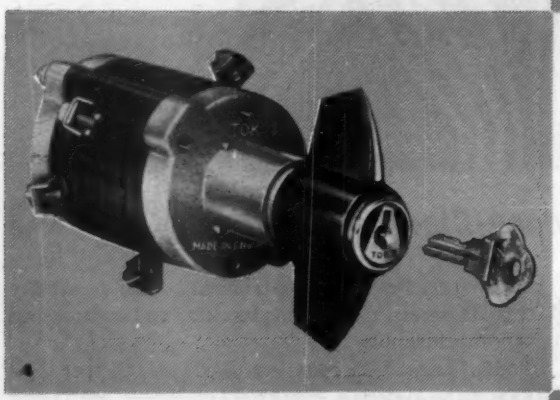

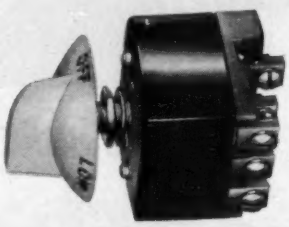

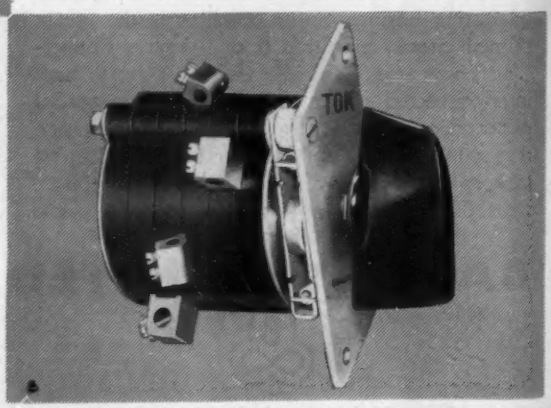

1 Packet Switch Type P13/1 13A 250V, 7A 440V.

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3 'Knoblight' Switch Type P13/7 13A 250V, 7A 440V.

4 'Knoblock' Switch Type P13/4 13A 250V, 7A 440V.

5 Heat Control Switch Type RB20 15A 250V.

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# Legg

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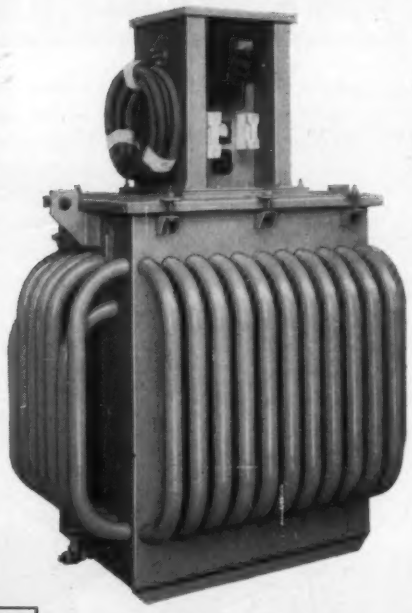

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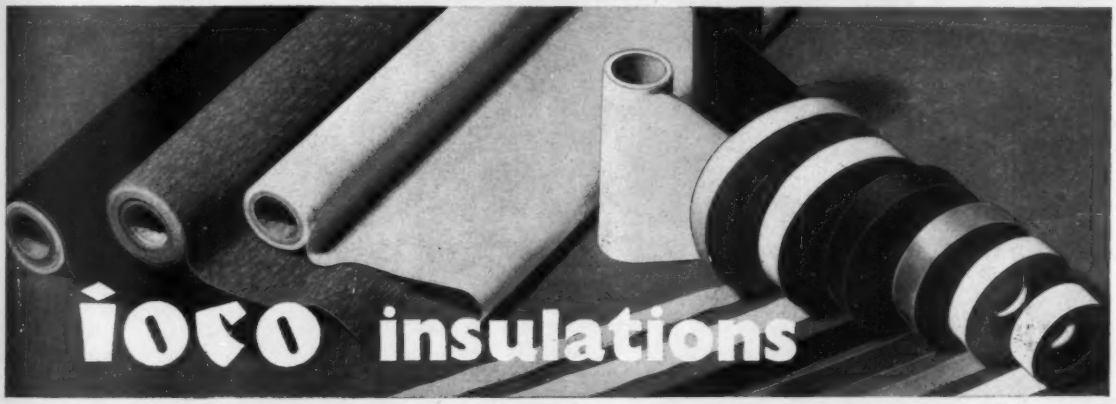


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**OCOSEAL.** A combination of Formapex and rubber sheeting used extensively for sealing electric condensers. Available in multi-ply form if desired.

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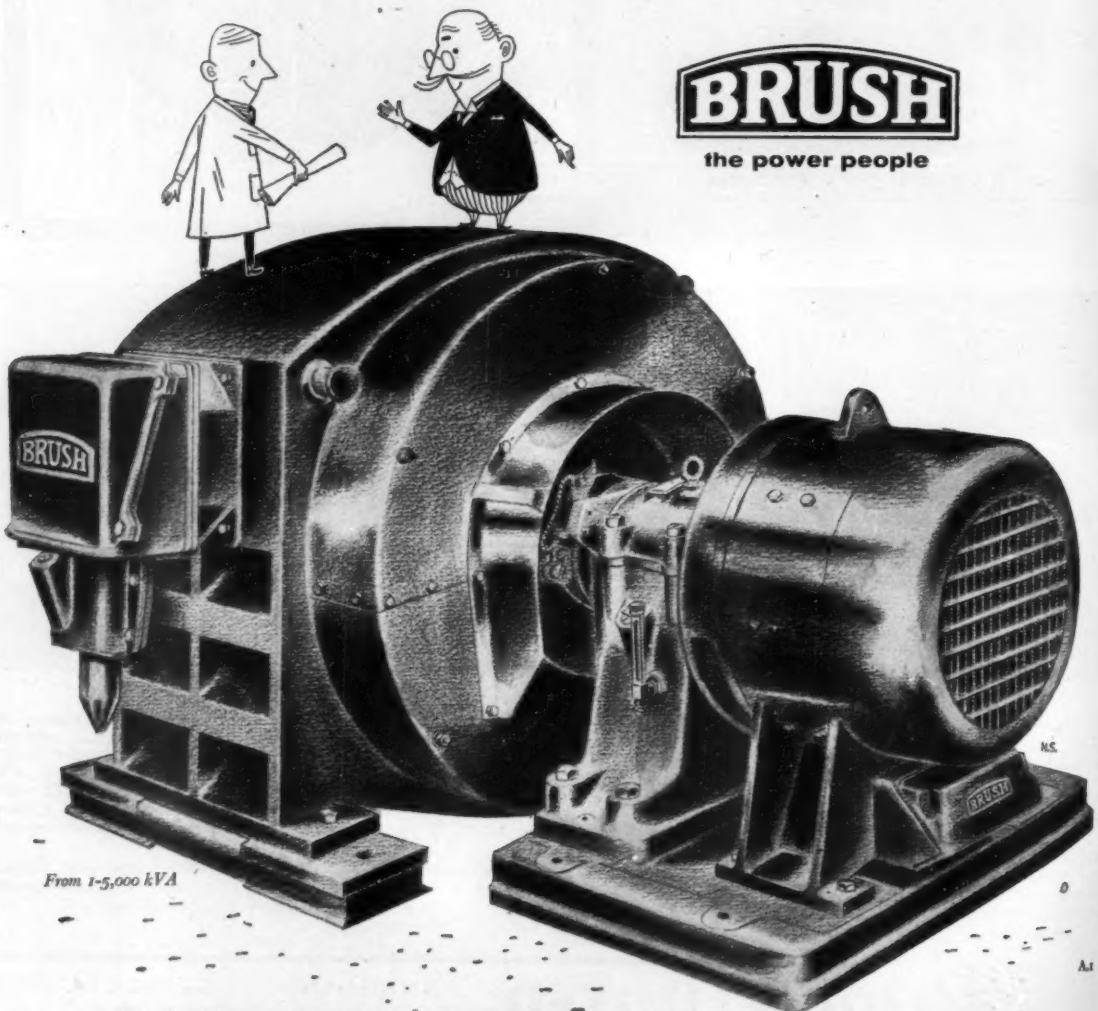


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21 MARCH 1958

# ELECTRICAL REVIEW

*Managing Editor:* HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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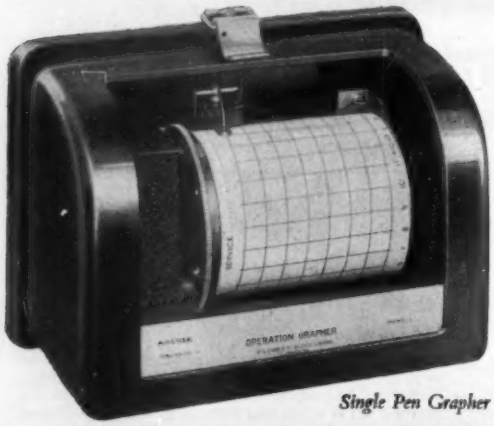


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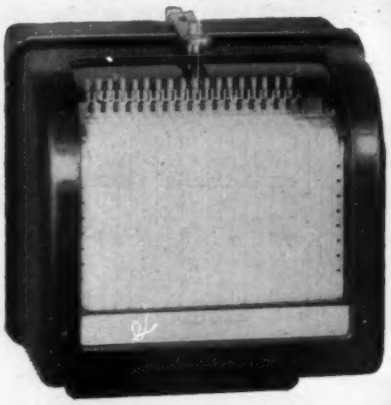

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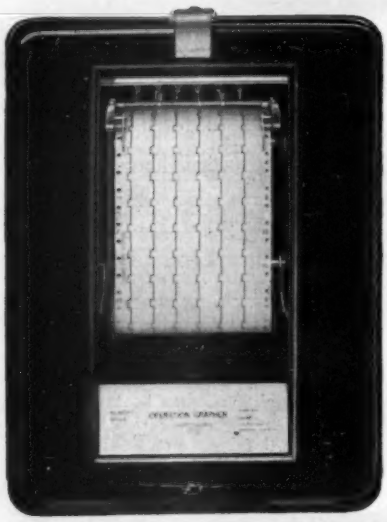

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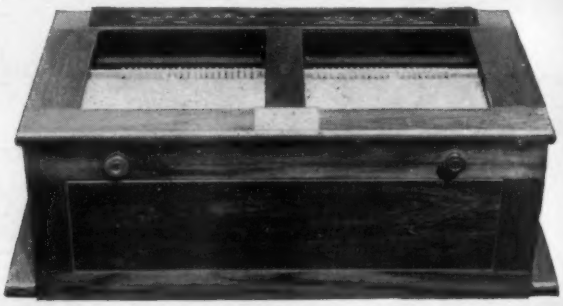

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ELECTRICAL REVIEW

21 March 1958 Vol. 162 No. 12 Established 1872

# Nuclear Power Future

IT is still permissible to be optimistic about the future of nuclear power development by British scientists and engineers, but it would be unwise to assume that all the consortia have to do is to carry out orders which are bound to come to this country. We are still well in front of America (and probably Russia) in this field, largely because we have settled upon one type of reactor instead of awaiting results from many designs employing different principles.

Potential customers overseas seem to have accepted the idea that the graphite-moderated gas-cooled reactor (the " Calder Hall " type) is likely to be the most practical for a long time to come—maybe until the harnessing of thermo-nuclear reaction is achieved on a commercial scale. Already as a result of the study of operation of the Calder Hall station, combined with intensive research and improved engineering methods, the power output of the nuclear stations has been dramatically increased. Speaking at the Erith establishment of the G.E.C.-Simon Carves Atomic Energy Group last week, Mr. A. L. G. Lindley said that it was now possible to build reactors with a net electrical output of 400 MW, which meant 800 MW stations instead of the 300 MW ones originally envisaged.

In this connection Mr. Lindley has been misunderstood in some quarters. He said that 18-20 stations of 300 MW were to be built by 1965, giving up to 6,000 MW. Four stations were already in hand to give 1,400 MW and there had been a cut in the programme; the remainder of the programme could be met by five or six stations of the new design (i.e. 800 MW). We think Mr. Lindley should have used the term " re-phased " rather than cut; this means the extension of the period of the programme by a year or two.

This greater concentration of power will mean a lower capital cost per megawatt and consequently cheaper energy. But it also reduces the amount of work for the nuclear power groups, which led Mr. Lindley to say that the nuclear industry was consequently likely to be very substantially underloaded.

Export possibilities thus became of greater moment. Already Italy and Japan have become firm " prospects " and Mr. Lindley said that practically every country in the world was interested. His own company had five or six tenders at the stage of active discussion. (In this matter Mr. Lindley mentioned £100,000 as the cost of preparing a tender.) Some countries, e.g., Germany and Japan, would be capable of supplying almost the complete plant if they were given the designs from Great Britain. In such cases terms would have to be arranged to secure an adequate return for the supply of technical knowledge and experience and of certain special equipment. As we have said

before, British manufacturers must be compensated for their heavy expenditure upon nuclear research and development and so the terms of any agreements should take full account of this.

All of the foregoing relates to large units. There are many other applications of nuclear energy, both for electricity supply and propulsion, which should help the atomic power groups to keep their establishments occupied. Similar doubts of the future were prevalent in the early days of electricity supply. Nuclear power is still only beginning; can there be any doubt of its ultimate part in the world's economy?

## SOUTH OF SCOTLAND OUTLOOK

The South of Scotland Electricity Board, set up on 1st April, 1955, last week published its third annual report (the first of these covered a nine-month period). In the two full years there were net surpluses of £1·27 million (1956) and £0·5 million (1957). Substantial as these figures are, they represent only 3·6 and 1·5 per cent respectively of the trading income. Since October, 1955, there has been no general review of tariffs though in that period costs have risen appreciably; in particular the Board faces higher depreciation and interest charges on its extensive programme of capital development. It is not surprising, therefore, that in forecasting the future the report gives a warning of the likelihood of increases in charges. Last year the average revenue per kWh sold was 1·468d which is very close to the average for England and Wales (1·469d) given in the 1956-57 report of the Central Electricity Authority.

## NEXT WEEK'S EXHIBITION

Much of this issue is devoted to a preview of the Electrical Engineers' Exhibition which is being held at Earls Court, London, next week. It will be seen from this that electrical concerns from the greatest to the smallest have taken space to show a wide variety of products. The rapid and continuing success of this show is a sure indication of the electrical industry's need for its own exhibition to supplement the displays which it puts on at practically all other exhibitions.

Since the demise of the electrical section of the British Industries Fair—and of the Fair itself—the Electrical Engineers' Exhibition has assumed even greater importance. This has been realised by the promoters—the Association of Supervising Electrical Engineers—who are to be commended for their enterprise and hard work.

## NUCLEAR POWER STATION RISKS

Even when a nuclear power station is welcomed by the local population there is not unnaturally some apprehension as to the dangers from radiation. The worse fears seemed to be confirmed by the Windscale accident last year but the White Paper provided an opportunity for emphasising again the inherent safety of the type of reactor used at Calder Hall and in the Central Electricity Generating Board's stations. It has also led to proposals for the licensing of reactors and for the setting up of an inspectorate under the Ministry of Housing and Local Government. At the Trawsfynydd inquiry the chief engineering inspector of the Ministry of Power gave an assurance that the safety aspect was being " well looked after."

In an article in the 1958 *Fuel Economy Review*, Lord Citrine is more specific. The fear of radioactive fall-out in the event of something going wrong in a nuclear power station is mainly fear of the unknown. A radioactive discharge could occur, but the magnitude of the fall-out, Lord Citrine states, is known and scientific and medical opinion confirms that it should not be at a level injurious to human beings. It is also reassuring to learn that should an incident occur, the staff in the station would continue to operate it and effect repairs. That could not be contemplated, says Lord Citrine, but for " complete confidence in the knowledge of such risks as may exist and how they can be overcome."

## WORKERS' VISITS TO BRUSSELS

It has been said that a visit to the Brussels Exhibition will enable one to see the world for fifty pounds. However little truth this remark is eventually found to contain, it is already evident that the exhibits will enable more to be learnt of the customs and cultural, scientific and industrial achievements of many countries than is practicable in the usual short stay abroad. We in this country are justly proud of our lead in many fields, but the criticism has been repeated too often to be ignored that we pay too little attention to the tastes and requirements of our overseas customers. Though the exports of the electrical industry have been raised to a remarkably high level it is increasingly difficult to maintain the past rate of progress, in view of growing foreign competition, local manufacture and import restrictions.

If a take-it-or-leave-it attitude was ever feasible it certainly is no longer. It is therefore important that it should be appreciated at all levels in industry that what is accepted or demanded by people here will not necessarily be welcomed in another country, where conditions are different. We therefore agree with Mr. D. Maxwell Buist, chairman of the organising committee of the British electrical and allied industry section, who recently stressed the desirability of " working men " visiting Brussels to see " something of what their country is up against." Though accommodation may be difficult for a protracted stay, day trips could be arranged from most industrial centres.

## B.B.C. TELEVISION CENTRE

The new B.B.C. television centre at the White City is costing £9 million over 11 years. The centre will include all the latest developments in television broadcasting and provision has been made, as far as possible, to allow for the additional requirements of colour television. If the present number of programme hours is not altered, the centre will accommodate all B.B.C. television broadcasting.

No organisation can function really efficiently in scattered temporary centres and if the B.B.C. is to maintain its reputation as the finest television service in the world a permanent centre is vital. As Mr. Gerald Beadle, director of B.B.C. Television, said last week, the new centre, the constructional progress of which is described in this issue, will be worthy of the world's oldest television service.

# NUCLEAR ENERGY RESEARCH

## Facilities of the G.E.C. Atomic Energy Division

*Working boxes for experiments on oxidisation and heat treatment of beryllium*

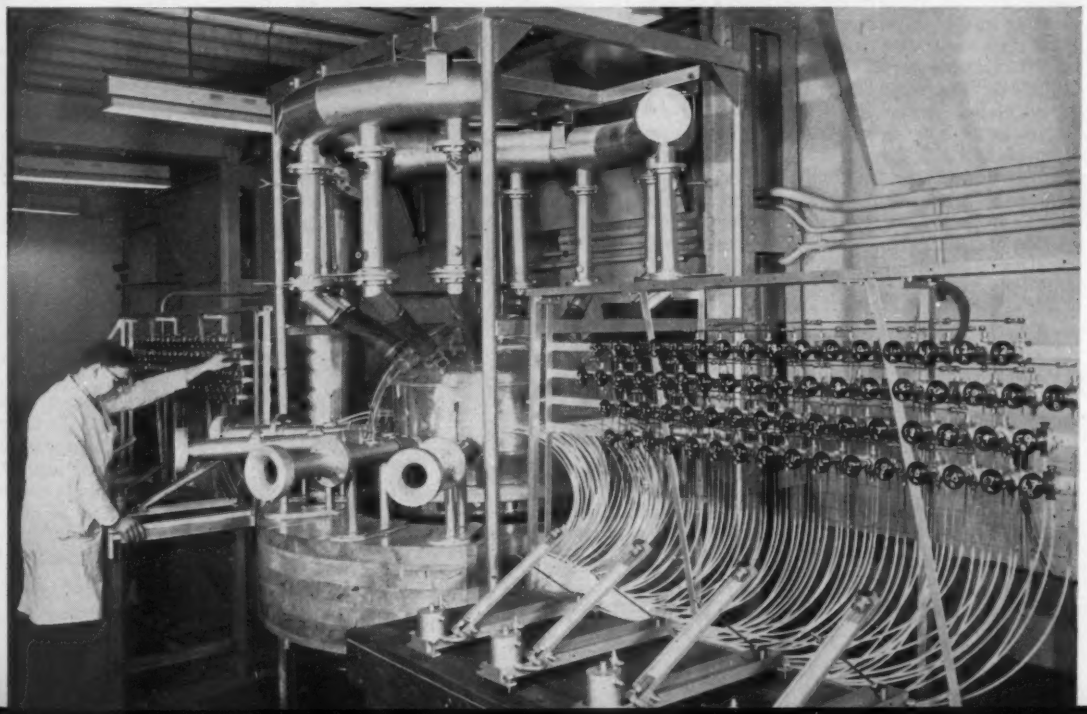
PROGRESS in nuclear research at the Erith Works of the General Electric Co., Ltd., has been not so much in the direction of discovery of new basic facts as in the development of new equipment to enable plant to be built at a lower capital cost. The research and development facilities have recently been considerably expanded. New laboratories have been established, and a large quantity of new equipment has been installed in those already existing.

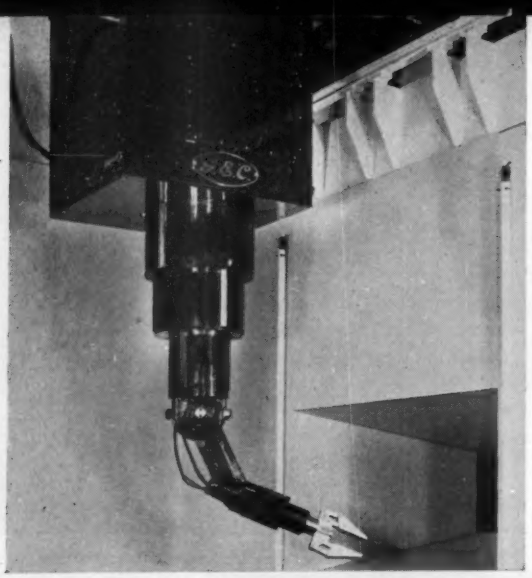
These new facilities are largely concerned with detailed experimental investigation aimed at improving the original design of the gas-cooled, graphite-moderated reactor with a view to increasing efficiency and reducing costs, and adapting it to meet special requirements, particularly for the overseas market. They include a laboratory specially designed and equipped for work on beryllium, while in another laboratory the prototype of a remote-controlled power manipulator is undergoing its final tests. A further laboratory is mainly concerned with mechanical engineering problems, an existing building having been converted for the purpose; the same building also houses a structural analysis laboratory. Additional administrative, design and drawing office accommodation has also been built.

Beryllium shows particular promise as a possible fuel-canning material. It possesses, however, certain toxic properties which make it necessary to adopt the most stringent precautions in all operations involving its use. The laboratory at Erith has been built to meet the peculiar requirements of this type of work. Its construction, lay-out, equipment and its elaborate ventilation system ensure that the atmospheric concentration of beryllium does not exceed 2 millionths of a gramme per cubic metre. A rigid code of practice has been evolved for all people using the building, and a system of regular and detailed medical examinations has been established.

The metal has a very low neutron-absorption cross-section; its melting point (1,280 deg C) is considerably higher than that of other metals already used for fuel-canning; its resistance to oxidation is good, both in wet and in dry carbon dioxide; and its high-temperature strength is excellent. Current information suggests that a beryllium fuel-can could probably be operated at temperatures of about 600 deg C. This would permit the maximum gas temperatures at the outlets from the reactor to be raised by at least 100 deg C above the level possible in current

*Reactor model for gas flow measurements*





*Above: Power manipulator. Right: Operator at power manipulator control console*

designs. Such an increase would result in a considerably higher thermal efficiency for a nuclear power station. But a great deal of work must be done in order to define the limiting conditions under which a beryllium-canned fuel element could be used.

In general terms, the purpose of the laboratory can be described as the study of the chemical and physical properties of beryllium metal in fabricated form. The first stages of the programme are largely concerned with investigations on mechanical properties at elevated temperatures and with measurements of oxidation resistance in carbon dioxide.

One of the major disadvantages of beryllium is its brittleness, and it is intended to pay particular attention to this aspect. In this connection, equipment for carrying out creep and stress-rupture investigations is at present being installed. Further subjects for future study include the welding of beryllium and the examination of the effects of aqueous corrosion.

The laboratory itself is divided into two areas, A and B. The A area is designed for operations of greater potential hazard, and has a higher air-extraction rate than B. The floor contains twenty-five drain points. Liquid effluent is discharged to a 400-gallon inspection and holding tank, which can be monitored.

The laboratory areas are completely air-conditioned by means of one central inlet air duct, and two ranges of extract ducting which run along the laboratory walls at ceiling height. The quantity of air extracted from the laboratory is greater than that admitted through the inlet manifolds. This ensures that a slight negative pressure is created in the laboratory, so that air leakage can occur only into the building. Failure of the extract system initiates a visual and audible alarm.

Initially, all experimental procedures involving the handling of beryllium will be carried out in ventilated working-boxes, each designed around a specific operation. All operations involving the formation of beryllium dust or chip (for example, machining, abrasion, and welding) are confined to laboratory A, where the highest ventilation rate is available.

The first general-purpose power-operated manipulator to be designed and produced in Europe, has been developed to provide remote-handling facilities in any situation where it is impossible, or undesirable, to employ a human operator. The manipulator is the mechanical equivalent of a human arm and hand but is capable of a greater range of movements than its human counterpart. It can lift and accurately position objects weighing as much as 750 lb, handle delicate glassware without breakage, pour and stir liquids, and wield hand and power-operated tools.

The complete operation of the manipulator is controlled by one person from a small console. Unlike the hand-operated manipulators commonly used for light handling duties, there is no mechanical linkage between the machine and the console, the only connections consisting of multi-core electric cable. There is, therefore, no limitation on the distance between the power manipulator and the operator so long as some means of remote viewing, such as closed-circuit television, is available. Special attention has been paid to the design of all non-metallic parts such as electrical insulators, lubricants, and paints, which may deteriorate under gamma radiation.

The manipulator consists of a grasping device carried on a "wrist," capable of continuous rotation, which is supported from a "forearm," "upper arm" and "shoulder." The arm joints are designed so that each section can rotate through 180 deg about its pivot, while the shoulder joint can rotate continuously about a vertical axis.

All the motions are powered by variable-frequency, three-phase, squirrel-cage induction motors. The variable-frequency supply is obtained from small motor-alternator sets which are accommodated with their associated control gear in a separate floor-mounted cubicle. The alternators, which have a fixed excitation, are driven by variable-speed d.c. motors. Speed variation is obtained by means of magnetic-amplifier control in the armature circuits, the resulting outputs ranging from 14 to 110 V and from 12·5 to 100 c/s.

One piece of apparatus in the mechanical engineering laboratory is a 1/20-scale model of a power reactor of the type being built by the G.E.C.-Simon Carves Atomic Energy Group at Hunterston (Ayrshire). This model is used to carry out investigations concerning the flow of coolant gas within the reactor.

The vertical fuel and control-rod channels through the core are represented by tubes of a number and diameter such that the core as a whole offers proportionally the same resistance to gas flow as will the full-scale structure. A motor-driven blower, coupled to the outlet ports in the "Perspex" sphere, draws air through the model to simulate the flow of coolant gas in the reactor. Measurements are made of the flow of air at the inlet and outlet ports and

of the pressure drop along selected channels through the core. By these means it is possible to investigate the symmetry of the gas-flow through the reactor and to study the effect of shut-down of one or more of the eight gas circuits which connect the reactor vessel to the steam-raising units.

When a fuel element is inserted into the reactor core during a charging operation, it is subjected to a considerable and relatively abrupt rise in temperature. A test rig has been built to ensure that this " thermal shock " has no deleterious effect on the structure of the fuel element.

The rig comprises a horizontal cylindrical channel, 14ft long and having a bore of 6in, filled with carbon dioxide at a pressure of 150 p.s.i. A length of this channel at one end is heated by means of two 5 kW electrical heating elements.

The complete fuel element under test is mounted on a carriage which can be moved along the channel, into the heated zone, by means of a chain driven by a handwheel. With this arrangement, the effects of different rates of insertion can be studied for various values of the temperature-gradient to which the element is subjected.

The spherical pressure vessel of the present G.E.C. design of power reactor is supported by means of a cylindrical skirt welded to the vessel. A 1/3-scale model of the pressure vessel and skirt has been constructed to study the effects on this skirt of sudden changes in the temperature of the cooling gas in order to prove conclusively that no excessive stresses are set up.

One of the vital aspects of a nuclear power station is the quality of the large amount of welding involved, and considerable attention is being given to this by the welding group at Erith.

The amount of heat that can be extracted from a fuel element by the cooling gas is one of the most important factors in the design of power reactors. The main apparatus used is one in which the measurements of heat transfer coefficients and friction factors are carried out on the can in carbon dioxide under conditions of temperature and pressure similar to those that will apply in the reactor.

The heat-transfer characteristics of extended-surface tubing for steam-raising units are assessed by passing dry superheated steam through the tubes and measuring the amount of steam condensed when a current of cooling air is directed over the tube bank.

The performance of fuel cans and steam-raising-unit tubes can be observed in a simple apparatus in which water flows longitudinally over a full-scale fuel can mounted in a transparent cylindrical channel. By injecting a marker dye or suspension into the water, the pattern of flow around the fins can be readily observed and photographed.

A valuable addition to the equipment of the heat laboratory is a full-size model of one of the standpipes. These standpipes provide the means of access by which the control rods enter the core, the necessary driving mechanisms being housed in chambers mounted on top of the pipes. The test-rig is connected at its lower end to an electrically heated pressure vessel which can be filled with either air or carbon dioxide. By this means, the conditions of atmosphere, temperature and pressure that exist within an actual standpipe can be reproduced inside the model.

---

# A New Ferrometer*

## Determination of the A.C. Magnetisation Curve and Iron Losses of Small Ferromagnetic Sheet Samples

By H. BLOMBERG, D.Sc., and P. J. KARTTUNEN, M.Sc.

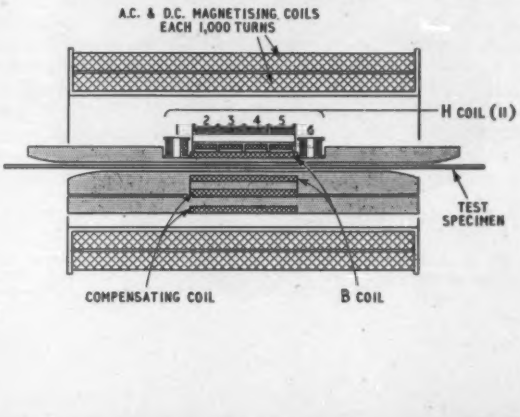
AT the request of an industrial enterprise manufacturing electrical machinery, the Electrical Engineering Laboratory of the State Institute for Technical Research, Finland, started work in 1945 on the design of a direct-indicating ferrometer which would enable the magnetisation curve and the iron losses of small ferromagnetic sheet samples to be measured. On the basis of this research work, the first measuring instrument of this kind was completed in 1950, and the second, improved, type in 1952.

### Principle of Operation

With regard to the device required for the magnetisation of the test specimen, the solution shown in Fig. 1 was finally decided upon. The test specimen is placed on the axis of an open-ended coil supplied with a sinusoidal voltage, and the magnetic flux-density curve of the test specimen is then relatively sinusoidal up to about 1·4 Wb/m². The actual measuring coils, i.e. the Rogowski-type H coil and the B coil surrounding the test specimen, as well as the compensating coil connected in series with the B coil and cancelling the effect of the magnetic flux in the air space between the test specimen and the B coil, are also placed within the magnetising device as can be seen from Fig. 1. The ferrometer has its own voltage source for magnetising at 50 c/s, but an external source has to be used for other frequencies.

The principle of operation of the ferrometer can be seen from Fig. 2. The e.m.f. induced in the B coil is fed into a negative feedback precision amplifier, which produces an output current proportional to the e.m.f. of the B coil at any time. This current is rectified and fed to a moving-coil instrument, where it produces a deflection

*Fig. 1.—Design of the magnetising and pick-up coils*




* Authors' summary of an I.E.E. Measurement and Control Section Paper " A Ferrometer for the Determination of the A.C. Magnetisation Curve and the Iron Losses of Small Ferromagnetic Sheet Samples." Professor Blomberg and Mr. Karttunen are at the State Institute for Technical Research, Finland. The paper was presented on 11th March by Professor F. Brailsford, of the Electrical Engineering Department, University College, London.

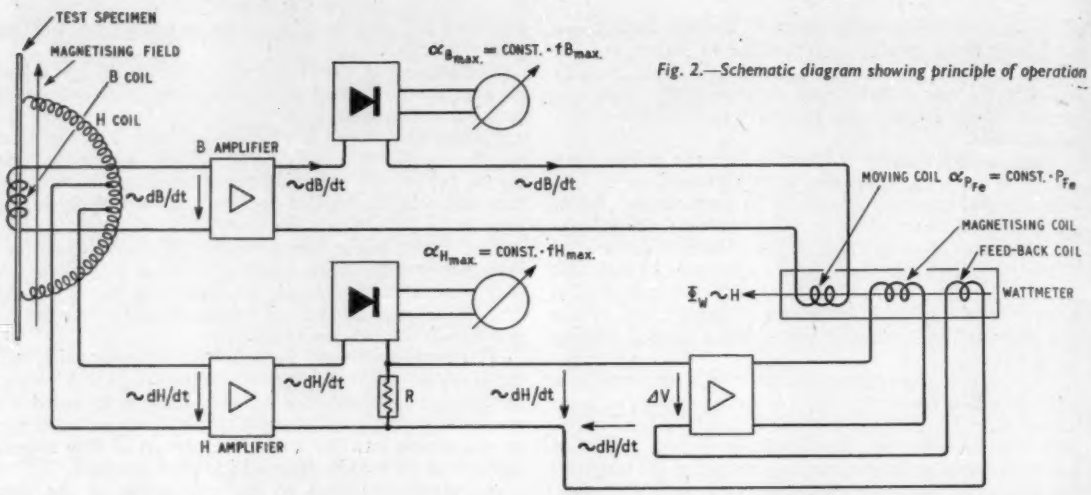



*Fig. 2.—Schematic diagram showing principle of operation*

proportional to the peak value of the magnetic flux density, $B_{max}$. A similar circuit is employed to measure the peak value of the field strength $H_{max}$, the sole difference being that in the latter case the amplifier is controlled by the e.m.f. induced in the H coil.

A voltage produced in the resistor R and proportional to the output current of the H amplifier is further used to control an integrating, negative-feedback amplifier providing the magnetising current of a wattmeter. By its action the wattmeter is magnetised so that the flux in its air gap is proportional to the field strength in the test specimen at any time. The output current of the B amplifier is fed to the moving coil of the wattmeter, and the deflection of this meter will thus be proportional to the iron losses $P_{Fe}$ of the test specimen.

## Measuring Ranges

The $B_{max}$ measuring instrument indicates immediately the $B_{max}$ value at 50 c/s frequency when the gain controls of its amplifier are adjusted to settings corresponding to the area of cross-section of the test specimen, which is determined on the basis of the weight, length and density of the specimen. The measuring range is changed by changing the B coil. The $H_{max}$ measuring instrument indicates immediately the $H_{max}$ value at 50 c/s frequency; its measuring range is changed partly by changing the H coil and partly by adjusting the gain of its amplifier.

The wattmeter indicates the iron losses per unit mass (W per kg) when the gain of the B amplifier has been adjusted to a value corresponding to the area of cross-section of the test specimen and when the density of the test specimen is 7·6 g/cm. The measuring range of the wattmeter is adjusted by means of a shunt associated with its moving coil. Moreover, its deflection is dependent on the $B_{max}$ and $H_{max}$ measuring range settings. The wattmeter constants corresponding to the different combinations of $B_{max}$ and $H_{max}$ measuring range settings are given in a table on the cover of the wattmeter.

If the measuring frequency $f_H$ has a value differing from 50 c/s, the indications of the $H_{max}$ and $B_{max}$ measuring instruments have to be multiplied by the correction factor $50/f_H$, and if the sample is of a density $\rho$ different from 7·6 g/cm³, the wattmeter reading has to be multiplied by the correction factor $7{\cdot}6/\rho$.

The measuring ranges of the ferrometer are:—
Frequency 50: 250 c/s;
Field strength 0·002: 500 amp/cm when f=50 c/s;
Field strength 0·0004: 100 amp/cm when f=250 c/s;
Magnetic flux 0·0004: 10 Wb/m² when f=50 c/s;
Flux density 0·00008: 2 Wb/m² when f=250 c/s;
Iron losses $8 \cdot 10^{-8}$: $5 \cdot 10^{3}$ W/kg when f=50 to 250 c/s;
Test specimen: 30 mm×200 mm;
Cross-section of specimen: 4-40 mm².

Part of the above-mentioned measuring ranges have no practical significance, e.g. 10 Wb/m² when f=50 c/s, and $5 \cdot 10^{3}$ W/kg.

*Fig. 3. — External view of the ferrometer*

## Applications and Accuracy

The ferrometer is suitable for the investigation of the properties of ferromagnetic sheets particularly when it is desired to measure the characteristics at a given point of the sheet and in a given direction of magnetisation. Since the measurement is carried out with a single, small sample piece, the ferrometer can be used further for investigation of the effects of mechanical working and heat treatment. If it is required to calculate the magnetic properties of an iron structure, in practice, frequently made up of inhomogeneous sheets, it is necessary to measure a great number of sample pieces in various magnetising directions in order to obtain sufficiently reliable initial values for calculation of the magnetic properties of the composite sheet structure.

It has been calculated that the accuracy of measurement of the ferrometer is 2 per cent, 1·5 per cent and 3 per cent for field strength, flux density and iron losses, respectively. It has proved exceedingly difficult to check these accuracy

figures experimentally. However, control measurements show that the accuracy is at least approximately equal to that predicted theoretically, as long as the magnetic flux curve, plotted against time, is not essentially different from a sinusoidal curve.

In addition to the measuring instruments proper, the ferrometer contains a small cathode-ray oscilloscope for the observation of the field strength and flux density curves and of the hysteresis loop. It is moreover possible, in the magnetising device, to superimpose upon the a.c. field a d.c. component, which can be adjusted to the desired value by means of the calibrating devices provided. The appearance of the ferrometer is shown in Fig. 3.

As an interesting application of the measuring arrangements employed in the ferrometer, measurement of the mechanical hysteresis effect may be mentioned. For instance, the measurement can be arranged in such a manner that the compression of the test bar is measured by means of a coil moving in a magnetic field, in which an e.m.f. proportional to the time derivative of the compression is induced, while the force acting upon the test bar by means of a spring is measured on the basis of the compression of this spring with the aid of another coil equally moving in a magnetic field, in which then an e.m.f. proportional to the time derivative of the force is induced. If these measuring coils are thought to replace the H and B coils of the ferrometer, the measuring instruments of the ferrometer provide immediate readings of the peak values of the force and the compression of the test bar, and of the hysteresis losses.

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By J. McFARLANE, B.Sc., A.M.I.E.E.,
P. MILNE, A.M.I.E.E.,
and J. K. DARBY, B.Sc.(Eng.), A.M.I.E.E.

# Improved Methods for Testing and Grading Electrical Steel*

THE silicon iron alloys, which form the magnetic cores of electrical machines and transformers, are supplied against a guaranteed maximum power loss at a specified frequency (usually 50 c/s) and flux density (usually 1·3 Wb/m² for non-oriented sheet, and 1·5 Wb/m² for oriented strip). The burden of testing and grading large quantities of material, which falls on the sheet manufacturer, calls for rapid and accurate methods. This requirement has led to developments, which form the subject of this review, in Lloyd-Fisher and Epstein square testing, in single sheet testing, and in single strip testing.

Although these equipments differ in detail, the basic approach is similar and is based on two themes, designed to meet the requirements of speed and accuracy:—

(i) The parameters to be measured, namely, flux density B, specific iron loss (watts/pound or watts/kg), and sometimes crest value of magnetising force $H_{max}$ are read directly on the meters, without the need for calculation of results.

(ii) Errors inherent in the system of measurement are reduced to negligible proportions by adequate design and, where necessary, with the help of electronic amplifiers.

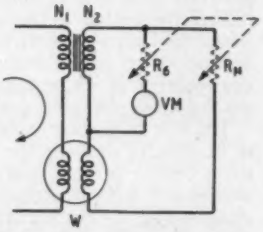


*Fig. 2.—Iron-loss measuring circuit*

One important source of error arises from waveform distortion resulting from the non-linear B-H relationship of iron, and is overcome by using a feedback amplifier method which ensures that B is sinusoidal. This technique is applied to all three equipments, and forms the subject of a separate review.

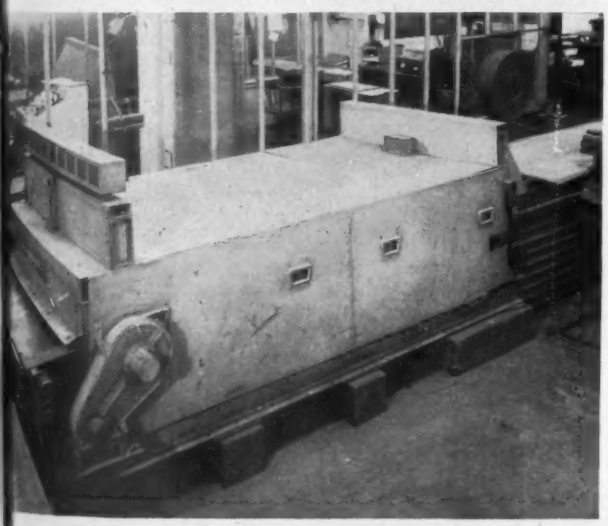


*Fig. 1.—Single sheet tester*

## Three Types of Loss Measuring Equipment

In the Epstein and Lloyd-Fisher test squares, which have been widely used for many years, the test specimen is formed by a number of rectangular strips inserted in the limbs of a square to form a closed magnetic circuit. These methods, speeded up by the application of direct reading circuits, are still used for grading the lower silicon (dynamo) grades and also grain-oriented transformer steel.

The cost of energy dissipated in iron losses in the core of a power transformer during its lifetime is of the same order as the capital cost of the transformer. This has placed a premium on low-loss material and has resulted in the marketing of successive grades of transformer steel differing in loss by only about 7 per cent. In the case of hot-rolled transformer steel, the spread in losses between individual sheets in a batch often exceeds the 7 per cent difference. This exposes the fundamental weakness of the sampling associated with test squares. A sampling technique cannot ensure that every sheet is

* Summary by the authors of a paper "Direct-Reading Iron-Loss Testing Equipment for Single Sheets, Single Strips and Test Squares," presented to the I.E.E. Measurement and Control Section on 11th March. Mr. McFarlane and Mr. Darby are at the Guest, Keen & Nettlefolds Group Research Laboratory. Mr. Milne, who was formerly at that Laboratory, is now with Electric & Musical Industries, Ltd.

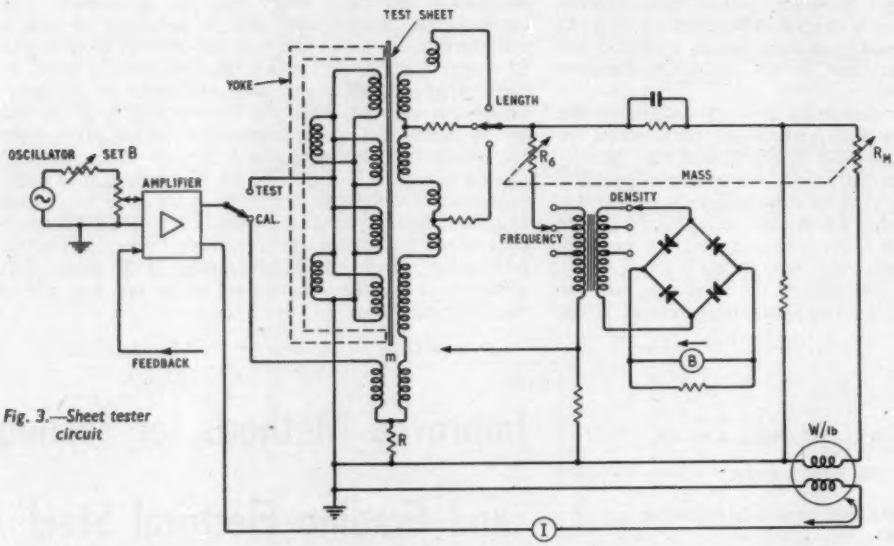



*Fig. 3.—Sheet tester circuit*

of the sheet loss, and a permanent correction of this amount is made in calibration.

In a more detailed circuit of the sheet tester (Fig. 3), it is seen that other adjustments are provided to allow for a range of values of the length and density of the sheet and of the test frequency. A standard resistance R and mutual inductance m can be switched into the circuit, instead of the magnetising coils, for calibration purposes. Various wattmeter ranges are provided by series/parallel switching (not shown in Fig. 3) of wattmeter coils.

correctly graded, and sometimes a whole batch may be incorrectly graded if the samples are unrepresentative. These difficulties can best be overcome by individual non-destructive testing of every sheet, and have led to the development of single sheet testers (Fig. 1) capable of grading up to 400 sheets per hour.

The electrical sheet manufacturer often finds it useful to be able to measure the magnetic properties of small strips (in the present case 25 by 7 or 15 by 2 cm), for example, to compare annealing processes on a laboratory scale, to find the distribution of losses over a whole sheet, or to measure the effects of tension by straining the strip while it is undergoing test. This requirement has led to the development of a single strip tester—essentially a small-scale version of the sheet tester, though the difference in size requires changes in technique.

## Direct Reading Measuring Instruments

Fig. 2 outlines the classical method of iron loss measurement. Here the magnetising current is increased until the voltmeter VM gives a reading appropriate to the required flux density B. The voltmeter reading is also dependent on the cross-section of the test sample, and hence on its mass, density and length (if this is a variable). The wattmeter W records the sum of the iron loss and the copper loss incurred by loading the winding $N_2$.

In the single sheet tester the mass of iron tested is about 10 lb, and the iron loss is correspondingly large. By using a low consumption "voltmeter" and wattmeter the copper losses are rendered negligible in comparison. The addition of variable resistors $R_6$ and $R_M$ (Fig. 2) enables the total resistance of the two secondary circuits to be made proportional to the sample mass, so that the voltmeter records flux density and the wattmeter reads specific loss. These variable resistors are mounted on the weighing machine, shown in Fig. 1, which precedes the test bed.

In the sheet tester uniform magnetisation is achieved by providing a low-reluctance return flux path through a laminated U-shaped yoke, and by winding the magnetising coil $N_1$ in a number of parallel sections, some of which enclose the yoke. Unfortunately, the yoke loss is measured in addition to the sheet loss. By employing a yoke weighing over 1½ tons, its loss is reduced to about 1 per cent

This example serves to illustrate direct-reading iron testing circuits. When applied to test squares and strip, tester instrument losses are no longer negligible, and amplifiers are introduced as in Fig. 4, to reduce the loading on $N_2$. At the low power factor (say, 0·2) associated with iron testing, the wattmeter currents differ from phase quadrature by about 12 deg, and an amplifier phase error of 0·012 deg will cause a wattmeter error of 0·1 per cent, which is the target. The attainment of this low phase error requires that the amplifier should have a feedback factor of between 60 and 70 dB. This presents considerable problems and requires double feedback-loop methods to ensure stability.

## Conclusions

By employing error-elimination techniques and direct reading instruments as outlined above, combined with flux waveform control, the sheet manufacturer is provided with a range of equipment with which production testing can be achieved both rapidly and accurately. Moreover, the introduction of individual grading of sheets of hot-rolled transformer steel has achieved a higher degree of uniformity than has previously been possible, and this is considerably to the benefit of the transformer manufacturer.

The equipment described in this review is installed at the works of Joseph Sankey & Sons, Ltd., of Bilston. It was developed at the G.K.N. Group Research Laboratory.

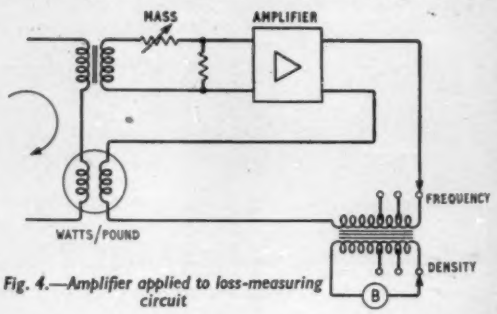



*Fig. 4.—Amplifier applied to loss-measuring circuit*

# Flux Waveform Control in Iron Testing*

By J. McFARLANE, B.Sc., A.M.I.E.E., and M. J. HARRIS, B.Sc.

ONE of the sources of error experienced in the measurement of iron losses under conditions of a.c. magnetisation arises from the generation of harmonic components in the flux waveform. Since eddy current losses and, to some extent, hysteresis losses are frequency-dependent, additional loss components are introduced, leading to errors in loss measurement, especially at high values of flux density. Approximate corrections can be applied by form factor measurement, but greater accuracy and reproducibility are obtained by an approach which maintains a sine-wave flux.

The generation of harmonic distortion can be considered with reference to Fig. 1, where an iron sample is magnetised in a coil of N turns by a current i supplied by a generator v. Z is a series impedance including the generator impedance and the resistance and leakage inductance of the coil N. Now, the non-linear B-H relationship defined by the hysteresis loop of an iron core implies that, when the core is magnetised with a sinusoidal B, the magnetising current shall contain harmonic components. Measurements show that the familiar "peaky" magnetising current waveforms of transformer core materials contain harmonic components which increase with the flux density in the manner shown in Fig. 2. The flow of these harmonic currents generates harmonic voltages in the series impedance Z. If the generator voltage v is sinusoidal, the voltage induced in the coil N cannot be sinusoidal, but must contain harmonic components which oppose those generated in Z. Analysis shows that relative to the fundamental, at the $n^{th}$ harmonic frequency, the percentage of harmonic voltage is proportional to the factor $h_n$ defined in Fig. 2 and to the ratio $Z_n/Z_1$. Here $Z_n$ is the value of Z appropriate to the $n^{th}$ harmonic frequency, and $Z_1$ is the impedance of the iron-cored coil N at fundamental frequency.

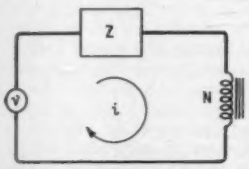


*Fig. 1.—Iron magnetising circuit*

## Waveform Control

A feedback amplifier method which corrects waveform distortion is shown in Fig. 3. Here an oscillator provides a voltage v′ to drive an amplifier which provides the iron magnetising current i′. A voltage derived from the secondary winding $N_2$ is also applied to the amplifier, in opposition to v′. This constitutes a closed loop control system in which, if the loop gain is high, the feedback voltage will be almost equal to the drive voltage v′. If v′ is a sine-wave, the feedback voltage (which is proportional to $\frac{dB}{dt}$) will also be sinusoidal, or very nearly so. It can be shown that the application of feedback reduces the $n^{th}$ harmonic content of the feedback voltage by an amount approximating to the loop gain or feedback factor operating at that harmonic frequency.

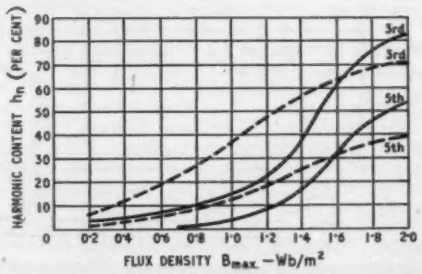


*Fig. 2.—Harmonic content $h_n$ of H wave under sine-wave B conditions expressed as a percentage of fundamental H.*
*- - - - - - 4% non-oriented silicon iron*
*——— 3% grain-oriented silicon iron*

The amount of feedback necessary to reduce the harmonic content to any desired value is readily calculable, and the problem resolves itself into one of design and stabilisation of feedback amplifiers.

## Automatic B-setting

The feedback circuit of Fig. 3 will cause the induced voltage in the secondary winding $N_2$ to follow the oscillator voltage v′ in magnitude and waveform, and this ensures that for a given iron sample, the frequency and flux density will be as stable as the frequency and amplitude of the oscillator. Good stability is important because iron losses vary approximately as the square of both frequency and flux density. An amplitude-stabilised Wien bridge oscillator provides adequate stability.

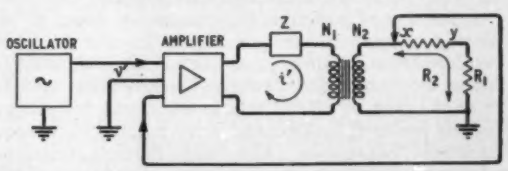
In production testing, successive iron samples, although nominally of the same dimensions, will vary somewhat in thickness, and this will alter the voltage required across $N_2$ for a given flux density. Allowance is made for this factor by taking the feedback voltage from the point "y" and altering the potentiometer ratio $R_2/R_1$ in proportion to mass (i.e. cross-section) of the sample. The adjustable part of $R_2$ lying between "x" and "y," which is a variable resistance, may be calibrated in units of mass or may be ganged to a weighing machine. The circuit allows the current through $R_1$ or the voltage across $R_1$ to be used as a measure of flux density B.

In this way successive samples are automatically excited to the required flux density without adjusting the voltage v′ from the oscillator.

## Applications

The feedback amplifier method of excitation has been applied successfully to several forms of testing equipment used in the production control of electrical steel. An

*Fig. 3.—Feedback amplifier control of flux waveform*




* Summary by the authors of an I.E.E. Measurement and Control Section paper, "The Control of Flux Waveforms in Iron Testing by the Application of Feedback Amplifier Techniques." The authors are at the G.K.N. Group Research Laboratory.

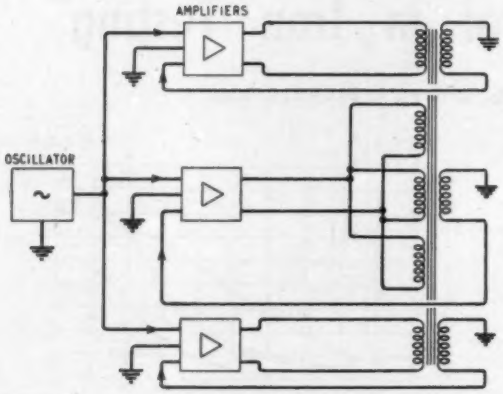



*Fig. 4.—Self-compensating system of three amplifiers for single strip tester*

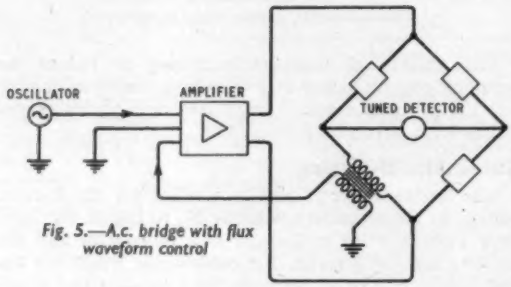



*Fig. 5.—A.c. bridge with flux waveform control*

amplifier of 150 VA rating is employed in association with Lloyd-Fisher or Epstein squares to produce flux densities up to 1·5 Wb/m$^2$ at 50 c/s in test samples of about 1 kilogram mass. A 1 kVA amplifier has achieved nearly sinusoidal flux densities of about 2 Wb/m$^2$, with less than 1 per cent harmonic content in the voltage waveform, on a 0·5 kg sample.

In a single sheet tester, used for grading individual sheets of transformer steel, the magnetising coils enclose a large volume of air and a relatively small volume of iron, and waveform distortion problems are more severe than in Lloyd-Fisher or Epstein squares, but satisfactory performance has been achieved with a 1 kVA amplifier.

In a small single strip tester difficulty was experienced in attaining adequate uniformity of field strength over the length of the strip (25 cm). Fig. 4 shows a system in which amplifiers are used to excite magnetising coils at each end of the strip, in addition to the main amplifier exciting the central magnetising coils. All three amplifiers are driven from the same source, while each has its own feedback coil. By this means the flux density at the centre and at the ends of the strip is maintained at a constant value.

Finally, an application to a.c. bridges and potentiometers may be mentioned, where another source of error arises when iron losses are measured. In a circuit, such as Fig. 1, the flow of harmonic currents causes power to be dissipated at harmonic frequencies in the resistive part of the impedance Z. If the generator voltage is sinusoidal, it cannot supply harmonic power. The non-linear impedance of the iron-cored coil acts as an energy convertor, absorbing power at fundamental frequency and emitting it at harmonic frequencies. The bridge detector, tuned to fundamental frequency, provides balance conditions which ignore the energy conversion and lead to high iron loss figures. If the flux waveform is maintained sinusoidal, using the circuit shown in Fig. 5, it is found that the harmonic frequency power is now supplied by the amplifier, and the iron loss inferred from bridge balance conditions agrees with wattmeter methods. The bridge method has been applied at flux densities as high as 1·7 Wb/m$^2$ at 50 c/s.

## DISCUSSION

Opening the discussion on the foregoing three papers, Mr. C. E. Webb (N.P.L.) said they had used during the last few months the equipment described by McFarlane and his colleagues in a fairly wide range of tests under varying conditions and with varying materials and had obtained very satisfactory agreement with the results obtained by their more primitive methods of test.

The comparative results obtained by McFarlane, Milne and Darby, by different methods, were most interesting. The satisfactory agreement between the single-strip and the Lloyd-Fisher tester was particularly valuable, in view of the use to which the single-strip tester and the single-sheet tester were being put. The discrepancy between the Lloyd-Fisher and Epstein figures, the Epstein giving lower losses, seemed to be a general result; at the N.P.L. they usually found a discrepancy of 3 per cent. He was unable to see where the error arose, or why. The issue should be cleared up in order to standardise on the apparatus giving the truest results.

Mr. D. Edmundson (B.T.H.) suggested that although the sheet tester described by McFarlane and his colleagues was very accurate by the standard of such devices, there would still be a large number of sheets which a customer could cut up, test and say had been incorrectly graded. The development described seemed to have become established at a moment when it was likely to pass into history. Some 70 per cent of the output of magnetic steel in this country was used in small motors and applications of d.c. machines, where accurate knowledge of the loss of individual sheets was unnecessary and the cost of testing unjustified. The other 30 per cent was used mainly in transformers, and here the hot-rolled steel for which the tester had been developed was being rapidly replaced by cold-rolled oriented steel. By the end of next year very few British transformers would still be using hot-rolled steel. The authors' tester could not deal with oriented steel, which was not delivered to the customer in such a form that its final characteristics could be measured; they were developed only after an anneal which took place after the laminations had been cut from the sheet. In future the material would probably be delivered in coil form. The tester, because of the weighing operation, could not deal with continuous strip. It seemed probable, therefore, that the use of sheet testers would in future be severely limited.

Mr. L. W. Law (Joseph Sankey & Sons) referred to the commercial use of two machines of the type described by McFarlane and his colleagues which had been in operation for some time for testing 8ft and 6ft sheets, respectively. Frequent checks were made of the accuracy of the plant, which was normally never more than 0·3 per cent out. Built-in calibration checks were used daily, and every hour a known sheet was put through to check any drift which had taken place in that time. For each batch of material a sheet was taken and its watts loss measured. A test-piece was cut from it and subjected to the Lloyd-Fisher test; the results were analysed and where necessary the calibration of the machine altered. The machine was also useful for helping in the experimental processing of sheets. The loss of a sheet was measured on the machine, and the sheet then subjected to some process and measured again, so discovering the result of the process quickly.

Mr. A. C. Lynch (P.O. Engineering Department) maintained that in principle, at least, a bridge might be better than a wattmeter, because a bridge measured a quantity almost independent of the flux density. In the wattmeter the power increased as the square of the flux density, so

that an error of about 3 per cent was possible, whereas with a bridge it ought not to exceed 0·2 per cent. When experimenting with the making of materials and their heat treatment it was often convenient to use specimens of small size, which could be done with the bridge.

Mr. E. Rawlinson (Metro-Vick) said that they had built an equipment similar to that described by McFarlane and his colleagues, and it had proved very satisfactory. Electronics had been introduced into precision measurements to such an extent that the time taken in measurement was now purely a question of assembling the steel into the tester and weighing it. They had tried to check the instrument error in the wattmeter and thought that it did not exceed ±0·1 per cent at full scale, even down to quite low power-factors. This made it possible to use portable wattmeters with more delicate suspensions.

Dr. O. I. Butler (Sheffield University) described experiments some years ago in controlling the waveform of magnetic specimens with the object of using relaxation methods for determining iron loss. They decided that the simplest arrangement was to have sinusoidal H control, and finally adopted a feedback method, using the sinusoidal main voltage and feeding back and inserting in the excitation circuit a harmonic voltage which would neutralise the harmonic voltage generated by the sample. With no feedback there was a dip at the peaks, and they could overfeedback and cause the peak to go the other way, so that they could get the intermediate position where they had merely to alter the gain of the amplifier to correct the waveform. This method had been extremely helpful in getting H sinusoidal.

Mr. P. H. King (Metro-Vick) pointed out that while oscillators of the kind described could in general be relied on to be accurate over fairly long periods to the order of 0·1 per cent on frequency, they were not infallible, and unless the frequency was checked one could not be sure that the equipment was working correctly. The building in of some frequency-checking device, perhaps a crystal oscillator, would be advisable.

Mr. G. W. Eastwood (P.O. Research Station) described a bridge which they had used for some time, primarily for measuring loss in nickel-iron alloys at audio-frequencies. The specimen was excited by a commercial 15 W amplifier, the current returning to earth via a 1 ohm resistor. Negative feedback was taken from the secondary winding of the specimen. About 20 to 22 dB of feedback was available without affecting the characteristics, and this proved sufficient for testing nickel irons up to flux densities of 6,000 gauss and silicon irons up to 15,000 gauss. The detector had a tuned amplifier of the parallel feedback type. A tuned amplifier was essential, since they were concerned only with balancing out the fundamental component, and there were considerable harmonic components in the output which would mask the balanced one. It was thus possible to achieve a useful measuring circuit which did not require special shaping of the feedback loop. The bridge was built entirely of components which could be purchased and merely required connecting together.

# N.E.S.C.O.E. Association

THIS year's annual dinner of the N.E.S.C.O.E. Association was held on 11th March in London with Lord Gridley (president) in the chair. The toast of "The Association" was proposed by Lord Mills (Minister of Power), who referred to his birth and upbringing on the North-East Coast and his recollections of the first electric tramways on Tyneside. The inception of the Newcastle-upon-Tyne Co. in 1889, he said, marked the opening of a second industrial revolution. Beginning with the supply of electricity to a few lamps, the company soon measured the load by horsepower rather than by candle power.

Although the field of activity was wider to-day, those engaged in it were still guided and inspired by the example of their forerunners. During the past nine years coal savings in these areas through increased efficiency in production had amounted to 31 million tons with a value of £100 million. As a result no increase in tariffs would be necessary this year. There seemed to be some kind of natural law that caused the consumption of electricity to be doubled every ten years. Power and transport provided the key to production in countries needing development as well as in those that were highly industrialised. Scientists and engineers were making very great contributions to cheapening electricity and to export trade, leading up to the building of atomic power stations and to the wonder of ZETA, although the latter might not be put to commercial use for many years.

Lord Gridley, responding, mentioned that the number attending the function was the largest yet in London. He recalled many personalities and events with which he had been associated during his 60 years' connection with various sections of the electrical industry, starting from the time before the practice of distributing d.c. supplies over short distances had yielded place to Ferranti's concept of long-distance a.c. transmission.

The health of "The Guests" was proposed by Col. E. H. E. Woodward, who remarked that the number of distinguished people present was too many for individual mention. Reply was made by Major-General L. E. C. M. Perowne, who recalled his connection with the Tyneside Electricals, the successive commanding officers of which were present.

Thanks to the president were voiced by Mr. J. R. Beard with happy reminiscences of him as general manager of the Cleveland & Durham Co. (later a component of the former North Eastern Co.) and expressing the great regret of members of the Association at his wish to retire from the presidency in view of his other commitments. In that event Col. Woodward would be prepared to accept nomination. With reference to the Kariba hydro-electric scheme, Mr. Beard said that the damage (limited to the temporary coffer dam) by the unprecedented flooding of the Zambesi River had been overstated in newspaper reports; no permanent damage had been suffered, all material had been salvaged and he did not expect that the completion of the project would be seriously delayed.

A tribute for his many years of service to the Association was paid by the president to Mr. S. G. Pike, who on his retirement from the industry this month will hand over to Mr. H. G. Nelson his responsibilities as hon. secretary.

## Census Report on Wires and Cables

THE Report on the Census of Production for 1954—Electric Wires and Cables (H.M. Stationery Office, 1s 9d) analyses the returns made by 83 establishments employing over 10 persons. Seven establishments employed an average of over 2,000 and there were two establishments which employed less than 10. The drop in the total number of employees from 63,700 in 1948 to 49,500 in 1954 is stated to be due to a reclassification of certain establishments rather than to any decrease in the numbers actually employed in the production of electric wires and cables.

In 1954 the gross output of the industry was £138 million, the net output £39 million and the wages and salaries bill £23·6 million. Capital expenditure (less disposals) totalled £4·7 million and the net output per person employed (excluding out-workers and including working proprietors) was £787. The report includes tables showing the sales of principal and other products of the industry and the purchases of material and fuel.

*B.B.C. Television Centre at the White City showing the scenery block at the left. The steel frame structure to the left of the main block will be the "nerve centre." The restaurant block is shown at the top centre*

# B.B.C. Television Centre

LAST week we had the opportunity of inspecting the progress made in the construction of the main block of the B.B.C. Television Centre at the White City. This consists of a multi-storey "ring" and is now framed to roof level. There are seven floors in the inner ring, in the centre of which will be a garden and sculpture. The studios radiate from this inner ring. The centre block covers an area of 3½ acres out of a total site of 13 acres. This main block should be ready for the installation of the television equipment in 1960 and the first four studios should come into operation in early 1961.

The Television Centre, when completed, will be the largest television headquarters in Europe. It will consist of the main circular block containing seven studios and several hundred offices, a scenery block, a restaurant block, a works block and eventually a "spur" from the main block. The scenery block has been in service since 1953. The restaurant block is in temporary service for rehearsals and offices and is now being altered to accommodate 700 diners on three floors at one sitting. The works block, for repair, storage and experimental apparatus, will not be built until restrictions on capital investments are eased. No detail planning of the "spur" will be done until experience has been gained in the operation of the main block.

The main block has been designed to allow scenery and properties to be conveyed to the studios direct from the scenery block via a continuous runway 20ft wide around the outer periphery and the artists will enter the studios from the inner ring. Thus, in operation, materials will move inwards and people will move outwards from the centre. The control rooms for each studio at first floor level will be part of the inner ring with windows looking into the studios in the outer ring. On the ground floor and basement of the inner ring there will be 120 dressing rooms for 550 people.

The first and second floors of the inner ring will accommodate the technical areas. The central wedge "nerve centre" in the outer ring will house technical areas on all floors including telecine, central control apparatus room, quality check rooms and the Continental control point for Eurovision. The telerecording department will be in the basement under the central garden.

In planning the studios, the possibility that colour transmission will one day be required has been borne in mind. The layout for the various areas and the provision for ventilation, lighting and power supply, etc., have all been designed so that the additional requirements that colour television will impose could be accommodated.

Mr. Gerald Beadle, director of B.B.C. Television, said that if there were no increase in the present hours of broadcasting, the new Centre would accommodate the entire day-to-day B.B.C. television programmes and the B.B.C. would dispose of its present Lime Grove and Riverside studios.

The architect for the work is Mr. Graham Dawbarn, C.B.E. (Norman & Dawbarn), in association with Mr. M. T. Tudsbery, C.B.E. (consulting civil engineer, B.B.C.). Sir Howard Robertson, A.R.A., P.P.R.I.B.A., and Sir William Holford, M.A., F.R.I.B.A., are architectural consultants for the scheme. Messrs. Ainsley are the quantity surveyors.

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### Radio and Electronic Component Show

MANY new radio components will be exhibited at the Radio and Electronic Component Show at Grosvenor House and Park Lane House, London, from 14th to 17th April. There will be 171 stands. Admission to the exhibition is by invitation only, applications for tickets to be made to the Secretary, Electronic Engineering Association, 21, Tothill Street, London, S.W.1.

# VIEWS on the NEWS

By REFLECTOR

IN countries where railway electrification extensions are becoming a commonplace, the Press must sometimes be hard put to it to announce each opening with freshness. A good effort in this direction was this recent headline in a French periodical:—"The Good Fairy Electricity Bends over the Cradle of French Railways." It related to the inauguration on 16th January of electric working from Lyons to St. Etienne, over the route of the first railway in France to use steam locomotives. Our own 50 c/s electrification programme is not without signs that the same French fairy has been leaning over the cradle of British Railways as well.

* * *

One of the chief attributes of domestic electrical appliances is their reduction of drudgery and we always stress this in advocating their use. But are we right in doing so? Are we not encouraging general flabbiness? These questions arise from reading a recent report by the Ottawa correspondent of *The Times*. This was a survey of the effects upon young Canadians of an excess of television which, by preventing them from taking exercise, is said to be inducing "T.V. legs"—a lack of flexibility in the lower limbs and lower back. The correspondent quoted a Canadian school medical officer as saying:—

> "Modern labour-saving devices did not encourage physical exertion. It was not necessary now to get out of a car to open the garage door, for an electronic device did that for you; a television programme could be switched on by pressing a button on the arm of a chair; and, he said, in the kitchen one did not have to use an arm to squeeze an orange any more."

There was a time when electric exercisers were popular but I do not hear much about them nowadays. Maybe the time has arrived for a revival.

* * *

Ironmongers are worried, says the *Sunday Express*, because the North Western Electricity Board is giving away miles of fuse wire.

> "Thousands of cards with up to six feet of wire have been given to householders to cut down repair costs. If the experiment succeeds the board's 1,500,000 consumers may get a free coil each. This would take about 1,700 miles of wire—enough to stretch from Manchester to Moscow—and would cost £6,000."

I do not see why ironmongers particularly should be worried; what about electrical retailers? Anyhow I think the Board's idea is a good one and the loss of business by others is negligible.

* * *

For a great exporting nation, Great Britain is singularly backward in her participation in foreign fairs and exhibitions and even her own British Industries Fair (ostensibly designed to promote export trade) has been allowed to wither away and disappear. Once again there is nothing very new about this. Fifty years ago the *Electrical Review* (20th March, 1908), reporting arrangements for the Franco-British Exhibition, said that:—

> "Advantage should be taken of the presence of representatives from all our Colonies and Dependencies, of merchants and others desirous of fostering both inter-imperial and foreign trade, to endeavour to form a permanent exhibition organisation, the objects of which would be the systematic utilisation of foreign exhibitions for the advancement of the Empire's trade and commerce in those countries in which they are held, and the establishment of permanent home exhibitions in the various parts of the Empire for the development of inter-British trade and commerce. Such permanent installations would form the nucleus of any participation in foreign exhibitions, and would cause the sources and products of the Empire to be locally known to its constituent portions."

Now, of course, we have British Overseas Fairs, Ltd., which, sponsored by the Federation of British Industries, is designed to fulfil some of the functions mentioned in the extract.

* * *

Following my recent note about the village "pub" whose lights were dimmed when those of the nearby church were switched on, comes a report from a Durham village where much the same thing is happening. In this case the inhabitants complain that when the parish church organ is playing "the lights in the village houses go down, television sets fade, and electric cookers and irons cool off" (*Manchester Guardian*). But the lighting of the church iself is also affected and the rector has had to have the lamps lowered "a further 2ft from the ceiling." This is another run-down National Coal Board supply, but the area is soon to be taken over by the Electricity Board. The *Manchester Guardian* heads its report:—"More Son Less Lumière."

* * *

It is not often that discussions upon electricity charges have such a satisfactory outcome (from the Electricity Boards' point of view) as one which recently took place at a recent meeting of the Frome Rural District Council. One member referred to what appeared to be the high cost of electricity, but representatives of the two Electricity Boards concerned showed that the price of electricity had risen to a much smaller extent than the prices of other commodities and that the Boards were operating on a very small profit margin, whereupon the Council decided (says the *Somerset Standard*):—

> "that the existing tariff arrangements with the respective Electricity Boards . . . be regarded as satisfactory and the best arrangements that could be made within the limit permitted by the Electricity Acts and the various tariffs available."

# LETTERS TO THE EDITOR

*Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.*

## Bakelite Lampholder Fault

IT is a little surprising that no one has come to the rescue of the Bakelite lampholder design criticised in your issues of 21st February and 7th March. Perhaps the manufacturers argue that anything conforming to a B.S. is beyond reproach, but does not your journal penetrate the ivory tower in Park Street? One would at least expect that the B.S.I. would stand by their offspring.

Mr. Neidle mentions a most important point, that the B.S. mark may be taken to indicate (high) quality whereas it only defines a minimum. Since suggestions from outside the charmed circle are not always welcomed it may well be a minimum which is below what a prudent engineer would accept (fireguards are a terrible example) or even inherently wrong design. The best results can only be expected if suggestions from outside are welcomed and in fact invited by notice in the technical Press before a new specification or a revision is prepared, and it must not be overlooked that these standards have a bearing on the good name of British products abroad.

And why the "Kite" mark? Surely "B" for British should stand erect not lie flat on its back. The name, too, is unfortunate, one of its less unpleasant slang meanings being a worthless cheque. As a kite to fly the design is poor and I hope it is not intended to represent a B.S. kite.

IGNOTUS.

## Power Station Managers

WITH reference to your editorial comments in the issue of 14th March regarding power station management, I would suggest that it is wrong to call the present station superintendent a power station manager. We are still engineers and I would suggest that the name be power station engineer and manager.

ENGINEER-MANAGER.

## Wasted Light

I AM delighted to see that the subject of the useful application of street lighting is at last being considered. Judging by the yellow glare in the sky at night over sodium street lighting, it is evident that a very high proportion, perhaps 30 per cent, of the light is wasted skywards. Except on a steep hill there is no excuse for radiating light above the horizontal.

Further, when the source of light is visible to the user the ratio of the direct light to that reflected by objects to be seen is very great. Or in communication terms, the noise to signal ratio is great. Can you imagine a theatre having lights a little above eye level shining more on the audience than on the stage?

*Bedhampton, Hants.* W. B. BROWN.

## "What Every Dealer Should Know"

FURTHER to the article "What Every Dealer Should Know" by Mr. E. H. W. Banner in your issue of 14th February, I shall be pleased if you will draw the attention of your readers to the change in British Standard 1362 entitled "Cartridge Fuse Links for Use in Plugs."

The original sizes of fuses were 3 A, 7 A and 13 A; the amendment published in 1956 (PD 2476 : 1956) deleted the 3 A and 7 A and added 2, 5 and 10 A. The concluding paragraph of the article is therefore misleading in so far as the 2, 5 and 10 A fuses are now covered under this appropriate British Standard.

*Dukinfield, Ches.* D. M. FENTON.

## Large Electrically Propelled Liner

THE P. & O. Steam Navigation Co.'s 45,000 ton turbo-electric passenger liner being built by Harland & Wolfe, Ltd., at Belfast, has been named *Canberra*. In this vessel two 32,200 kVA single-cylinder propulsion turbo-alternators, manufactured by the British Thomson-Houston Co., Ltd., will normally supply independently two double-unit 42,500 s.h.p. propeller motors, each driving one of the two screws. The turbines are designed for inlet steam conditions of 700 p.s.i.g., 950 deg F. As propeller reversals will be obtained electrically, the turbines are unidirectional and, consequently, no limitation of steam conditions is necessary during manœuvring; nor is there any limitation to the astern power available. Full power astern may be a feature of particular importance in future ships in view of the possible use of turbo-electric drive for nuclear propulsion where safety may demand rapid manœuvring in an emergency.

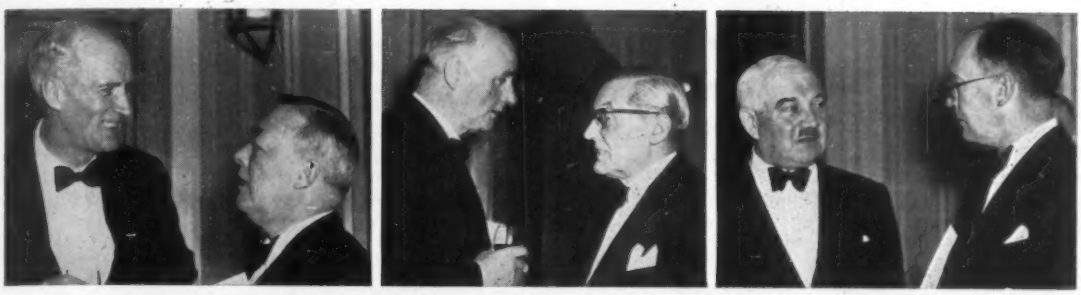
In the *Canberra* the turbo-generators are placed well aft to leave the amidships clear for passenger accommodation. This flexibility, due to there being no mechanical connections between the prime movers and the propeller shafting, may be expected to show to advantage in the nuclear-powered ship where the position of the atomic reactor will be determined by safety and weight considerations.

Improved consumption is permitted by the powering of both propellers from one turbo-alternator at reduced speeds. With the tendency towards larger tankers and twin-screw propulsion, interest is being shown in the proposal that the two screws should be powered by a single prime mover to reduce capital costs and secure fuel economy.

## Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

| | |
|---|---|
| ALUMINIUM ingots | ton £197 0s 0d |
| COPPER, H.C. Electro | ton £171 10s 0d |
| Fire Refined 99·70% | ton £170 0s 0d |
| Fire Refined 99·50% | ton £169 0s 0d |
| COPPER Tubes | lb 1s 7½d |
| Sheet | ton £193 10s 0d |
| H.C. wire and strip | ton £216 15s 0d |
| LEAD, English | ton £75 10s 0d |
| Foreign | ton £74 0s 0d |
| MERCURY | flask £77 0s 0d |
| TIN, block (English) | ton £731 0s 0d |
| ZINC, G.O.B. Foreign | ton £63 15s 0d |
| Electrolytic | ton — |
| BRASS Tubes (solid drawn) | lb 1s 4½d |
| Sheet | ton — |
| Wire | lb 2s 2½d |
| PHOSPHOR BRONZE Wire | lb 3s 5d |
| PLATINUM | oz £26 15s 0d |
| RUBBER, No. 1 R.S.S. spot | lb 22½d—23d |



*Left to right: Sir Christopher Hinton, Mr. S. B. Warder, Sir Henry Self, Mr. D. Bellamy, Sir Ben Barnett and Sir Ian Jacob*

# Electrical Supervisors' Dinner

## EMPHASIS ON EDUCATION

THE annual dinner of the Association of Supervising Electrical Engineers was held on 12th March at the Connaught Rooms, London, with Sir Harold Bishop (president) in the chair. About 800 members and guests were present.

The Rt. Hon. Geoffrey Lloyd, M.P. (Minister of Education), proposing the toast of the "Electrical Industry," referred to the vast industrial expansion which was taking place in Russia and their emphasis on hydro-electric power station construction. One station alone on the Angara River scheme at Bratsk would have a capacity of 3,600 MW. The flow of the Angara River was equal to that of the Volga, Don and Dnieper put together, and the scheme would quadruple the industrial output of this area of Russia. The development of world natural resources would result in other countries making for themselves many of the products they were now buying from Britain. To live, we had to export and, to do this, we had to be in the vanguard of technical advance so that we could offer the world products more highly developed than those which they were making for themselves. Technical education and training were vitally connected with this problem.

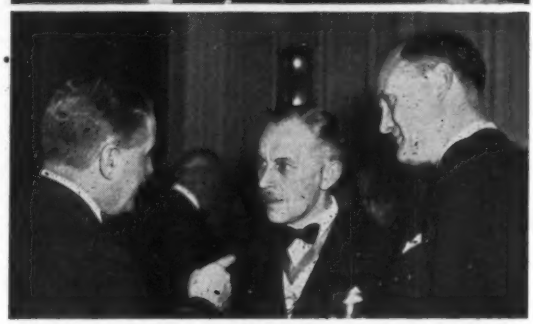
The electrical industry was the first to realise the link between technical education and technical advance. Electrical engineering accounted for 2,000 out of the 9,000 Higher National Certificates awarded last year, mainly to part-time students. But the industry was also amongst the first to realise that the complexity of modern technology made it increasingly difficult for many students to go on for professional qualifications by part-time study alone. About 40 full-time and sandwich courses in technical colleges had been approved for the new Diploma of Technology. The largest single group of students was in electrical engineering with an enrolment of about 500 out of a total of nearly 1,400.

The Minister also congratulated the electrical industry on its development of courses for technicians and craftsmen. Industry generally had not yet fully grasped that it was not enough to put forward a general demand for more and better technical education. It was much more important to follow the lead of the electrical industry in identifying the jobs for which specific types of training were required, and then to co-operate with the technical colleges in setting up "tailor-made" courses.

The response was by Sir Christopher Hinton who recalled that it was in the years when Mr. Lloyd was Minister of Fuel and Power that, in spite of much criticism, many developments took place in conventional power station equipment. Pressures were raised and the size of sets was increased. The electrical industry owed a debt to Mr. Lloyd whom Sir Christopher called the "father of the nuclear power programme," but now that Mr. Lloyd was the Minister of Education we were even more dependent on him.

When Sir Christopher graduated it was unfashionable to have a degree in engineering, but the pendulum had swung in the other direction and now it was unfashionable not to have a degree in engineering. Neither extreme was good for industry. A good team was built up with men of varying types of education.

Mr. G. H. Parker, chairman of the A.S.E.E., responded



*Top: Mr. Geoffrey Lloyd and Sir Harold Bishop. Below: Messrs. J. S. A. Bunting, H. S. Wathes and E. B. Sawyer*

on behalf of the Association and said that the people in the electrical industry represented one-fiftieth of the population of Great Britain. The electrical industry had to grow if Britain was to survive and adaptability was most important.

The health of the guests was proposed by Sir Harold Bishop who thanked Mr. Lloyd for his speech. Technical education was a national problem. A young man might be tempted to skip his training to earn a high wage, but he should realise that education was for life. He hoped that the Minister was convinced of the Association's interest in education.

Mr. C. T. Melling, vice-president of the Institution of Electrical Engineers, responded for the guests. He welcomed the views of the Minister of Education whose plans for more technical courses were securely founded. A broader based education was required and there was great scope for the apprentice. He referred to the Electrical Engineers' Exhibition and stressed its educational value.

# Transformer Impulse-Voltage Distribution

PREDICTION at the design stage of the distribution of impulse voltages throughout the windings of large power transformers formed the subject of a paper presented on 12th March before the Supply Section of the Institution of Electrical Engineers by Miss B. M. Dent and Messrs. E. R. Hartill and J. G. Miles (Metropolitan-Vickers Electrical Co.).

The method described, which used a high-speed digital computer, was found to be suitable for routine design. The authors showed its applicability to non-uniform windings and to any form of applied voltage, including chopped waves, and the practicability of its extension to cover winding resistances and variable inductances. The procedure could also be extended to calculating neutral current with the effect of faults at different winding positions and of various chopping times of the rod gap. Correct values of intersection voltages near the line end of a substantially uniform winding were shown to require inclusion of inter-turn capacitance, entailing representation of the uniform winding by a non-uniform equivalent circuit. Specific representation of mutual inductances was also regarded as essential.

After discussing the derivation of the transformer equivalent circuit together with the computer programme for the solution of the resulting differential equations and comparing the results with other recent theoretical work, the authors described check tests, using a recurrent-surge oscillograph, which were made on a 1,000 MVA experimental transformer.

For the ascertainment of computing times it was considered sufficient to continue the computation only to a point corresponding to the time required for the wave to travel once down the winding (9 microsec for the transformer under test), since maximum values to earth and intersection voltages throughout the winding, associated with this first passage, were of primary interest to the design engineer. In the later stages of the transient various secondary factors became significant, such as flux penetration and winding losses. The time taken for a computation depended on the integration intervals (24 sec in the present case) necessary to obtain the requisite accuracy in the numerical process employed, and on the printing intervals (32 sec) to afford accurate observation of the rapid voltage oscillations, particularly across the winding sections near the line end. The time taken for one complete calculation totalled 2 hr 13 sec which corresponded to a cost of £89 at a representative charge for computer time of £40 per hour.

## DISCUSSION

Mr. E. T. Norris (Ferranti, Ltd.) said that the cost should be less using a computer, but it was usually fixed by the owners in the hope that they would break even at the end of the year, and was a purely arbitrary figure. A designer might be able to work out the impulse strength and characteristics by longhand in three hours, whereas with the computer he might have to wait a week or so until it was available, turning to some other work in the meantime. Computers were so expensive that they had to work almost continuously or they were ruinous.

Mr. J. R. Reed (General Electric Co., Ltd.) said his company were working along similar lines to the authors but had used Rudenberg's travelling-wave method for use with disc-type windings. They had applied the Norris and Rudenberg method to the calculation of what happened on chopped waves to well within commercial design accuracy. They liked the method because it gave the voltage between adjacent discs. They had found it worth while to programme Rudenberg's method for a digital computer at a cost of £6 to £7 as against the authors' £89.

Mr. E. L. White (Electrical Research Association) pointed out that a number of theories on oscillations in transformer windings had been put forward in which the distributed mutual inductance along the winding had been taken into account in formulating the basic equations of the theory. He was therefore a little surprised that the authors had spent considerable time in trying to justify the inclusion of mutual inductances as distributed constants. He would have thought that with the digital computer it would have been possible to show, for example, the comparison between the various approximations, and this would have been useful to designers. The verification of the authors' methods had been shown mainly in the form of maximum voltage envelopes, but this was perhaps unfortunate. The maximum voltage envelope was not particularly sensitive to the assumptions regarding mutual inductance distribution. While maximum voltage was the main interest of the designer, the cost of the computer was so enormous that it might as well start off with a theory which would give the correct response for a wide variety of considerations, not only maximum voltages but, for example, the frequency spectrum of the winding.

## World Power Conference

COPIES of the general programme issued by the Canadian National Committee in connection with the Sectional Meeting of the World Power Conference to be held in Montreal from 7th to 11th September next, are now available and can be obtained from the Secretary, British National Committee of the World Power Conference, 201-2, Grand Buildings, Trafalgar Square, London, W.C.2. Each copy sent to an address in the United Kingdom is accompanied by an explanatory circular letter dealing with the journey to and from Canada, the post-conference tours, currency arrangements and so on. All applications must be submitted through the British National Committee. The necessary forms are contained in the general programme.

So far 43 British engineers have announced their intention of participating in the Conference, but it is thought likely that the number will finally exceed 100.

# PERSONAL AND SOCIAL

## *News of Men and Women of the Industry*

The Minister of Power has re-appointed **Mr. E. T. Judge,** M.A., of Marton, Yorkshire, and **Mr. E. J. Hunter,** of Stocksfield, Northumberland, as part-time members of the North Eastern Electricity Board, **Mr. J. R. Potts,** O.B.E., J.P., of Carlisle, and **Mr. E. J. Smith,** Chorley, Lancs., as part-time members of the North Western Electricity Board, and **Sir George Gater,** G.C.M.G., K.C.B., D.S.O., J.P., as a part-time member of the London Electricity Board.

The General Electric Co., Ltd., announces that, as from 1st April, **Mr. R. N. Millar** will be appointed general manager of the company's Fraser & Chalmers Engineering Works at Erith, Kent. Mr. Millar has been manager of the Atomic Energy Division since its creation three years ago. He will still be responsible for the company's atomic energy activities, but he will be assisted in this field by **Dr. K. J. Wootton,** who will succeed him as

*Mr. R. N. Millar*

*Dr. K. J. Wootton*

manager of the Atomic Energy Division.

Mr. Millar was educated at Marlborough College and, after serving an engineering apprenticeship at the Fraser & Chalmers Engineering Works, went to Emmanuel College, Cambridge. After the war, during which he served in the Royal Navy as an engineer officer, he became an assistant mechanical engineer to the British General Electric Co. in South Africa where he took another degree in economics and industrial administration. In 1952 Mr. Millar was appointed chief mechanical engineer to the B.G.E. Co. in Sydney, Australia. Towards the end of 1954 he was recalled to take charge of atomic energy developments in the G.E.C.–Simon-Carves Atomic Energy Group.

Dr. Wootton was educated at Watford Grammar School and Imperial College, London, where he obtained a first-class honours degree in mechanical engineering. After a period as a research engineer with the Shell Petroleum Laboratories, he joined the R.A.F. and was commissioned in the Technical (Engineer) Branch. Dr. Wootton returned to Imperial College for three years after the war to carry out heat transfer research and then joined Vickers-Armstrongs, Ltd., as a research and development engineer. In 1951 he was appointed head of the Mechanical Engineering Department, University College, Khartoum, and remained there until joining the G.E.C. in 1955. He was appointed deputy manager of the Atomic Energy Division in November last year.

**Mr. E. W. Ashby,** B.Sc.(Eng.), M.I.E.E., who joined Callender's Cable & Construction Co., Ltd., in 1925, has retired from the Liverpool branch of British Insulated Callender's Cables, Ltd., where he held the position of transmission engineer. From 1914 to 1919 he served with the 37th Division Signals, Royal Engineers, and at the end of the war went to Sandycroft, Ltd., as contract and estimating engineer under the late Mr. L. J. Hunt, subsequently taking charge of electrical and mining machinery contracts until 1925.

Mr. Ashby was chairman of the Mersey and North Wales Centre of the Institution of Electrical Engineers for the session 1951-52 and has been a member of the Association of Mining Electrical and Mechanical Engineers for over thirty years. He is a member of the Council of the Liverpool Engineering Society. A farewell luncheon and presentation were given recently by his colleagues in the company and of the B.I.C. Construction Co.

The B.B.C. announces that **Mr. G. Phillips,** Associate I.E.E., A.M.Brit.I.R.E., has been seconded to the Kenya Government Broadcasting Service as chief broadcasting engineer. In 1952 Mr. Phillips was seconded as chief broadcasting engineer, Uganda, in which capacity he planned and supervised the installation of the new Uganda Broadcasting Service. Since returning to this country in 1956 he has been attached to the B.B.C.'s Engineering Information Department.

**Mr. C. W. Symmonds,** managing director of the Dublin Branch of Falk, Stadelmann & Co., Ltd., received on his retirement this month after more than fifty years' service, an inscribed silver tray from the members of the Executive Council of the Society of Irish Electrical Traders as a token of appreciation of his work as hon. treasurer of the Society for the past seventeen years.

The presentation was made by Mr. C. J. Nolan, chairman of the Council, at the annual meeting of the Society in Jury's Hotel, Dublin. He paid a tribute to Mr. Symmonds' work and said that he had been president of the Society before taking on the duties of hon. treasurer. Mr. Symmonds in acknowledging the gift said the Society had been of wonderful benefit to the electrical trade.

Consequent upon the retirement of **Mr. L. J. Fairhurst,** British Insulated Callender's Cables, Ltd., has appointed **Mr. T. P. Rome,** D.F.H., A.M.I.E.E., as his successor as Liverpool branch manager.

Mr. Fairhurst joined the company in 1912, served in the 1914-18 war, and transferred to the Liverpool branch in 1926. In 1944 he was appointed

*Mr. L. J. Fairhurst*

*Mr. T. P. Rome*

Liverpool branch manager, a position he retained until retirement.

Mr. Rome joined B.I.C.C. in 1951. He moved to Liverpool in the following year when he became capacitor engineer for the "Manweb" area and Northern and Southern Ireland. He was educated at Uppingham School and Faraday House. From 1944 to 1947 he served in the Royal Navy and he is at present a lieutenant in the R.N.R.

**Mr. H. R. Botting,** chief buyer of R. B. Pullin & Co., Ltd., has completed 21 years' service with the company, and he was recently presented with

*Mr. P. J. Ellis, managing director, R. B. Pullin & Co. (left), making a presentation to Mr. H. R. Botting*

*Left: Dr. Willis Jackson, vice-president of the I.E.E., in conversation with Mr. F. R. Perry, chairman of the North Western Centre, and Mr. G. S. C. Lucas, vice-president of the I.E.E., and Right: Mr. F. Day, hon. secretary, North Lancs. Sub-Centre; Mr. R. G. Green, G.P.O.; Mr. T. J. V. Halton, G.P.O.; Mr. H. G. Cope, chairman, North Lancs. Sub-Centre; Mr. A. L. Green; and Mr. C. E. Smith, vice-chairman, North Lancs. Sub-Centre*

a gold watch to mark the occasion by Mr. P. J. Ellis, O.B.E., managing director. Mr. Botting commenced with the company in 1937, became production manager in 1950, and has been chief buyer since 1955. During the war he served in the R.A.F.

The following appointments are notified by Brown Brothers, Ltd.:— **Mr. F. A. Dunmore,** to be national sales executive (motor); **Mr. G. B. Spence,** national sales executive (radio and electrical); and **Mr. C. Biggs,** national sales executive (tyres).

The staff of **William Steward & Co., Ltd.,** celebrated the company's silver jubilee at a dance on 14th March. The business was founded in 1933 by Mr. W. E. Steward, the present managing director, and the company now carries out installation contracting work and motor servicing in all parts of the country, in addition to manufacturing special switchboards and boiler-house automatic control panels. At the dance Mr. S. F. Steward, a director of the company, made presentations to Mr. J. R. Catchpole, the first employee, who is now an executive director, and to Mr. F. Wright, who joined the company in its first year.

*Mr. W. E. Steward*

On 11th March the **I.E.E. North Western Centre** held its annual dinner at the Midland Hotel, Manchester, under the chairmanship of Mr. F. R. Perry, and well over 450 members of the Centre and their guests were in attendance.

The toast to the Institution was proposed by Dr. W. D. L. Greer, Bishop of Manchester. He said that he was very impressed by the way in which the I.E.E. had increasingly drawn new techniques and spheres of work within its compass.

The response was made by Mr. G. S. C. Lucas, vice-president of the I.E.E., who said it was time that arts graduates learnt something of the language of science so that they could express what they wanted to engineers and scientists when they were in positions of authority. He then referred to the President, Mr. Goldup, who was on a world tour, travelling to Africa, the Near East, India, the Far East, Australia, New Zealand, Canada, and the United States. He wished him every success in this strenuous task.

Turning to the shortage of professional manpower, Mr. Lucas said they focused attention on the technicians who out-numbered professional men by 5 : 1. Many of these men had qualities which would enable them to take on the responsibilities of professional engineers and there was no reason why we should not be able to draw on these men to fill posts which would be filled by professional men if they were available.

A toast to the guests was then proposed by the chairman and Mr. P. B. Dingle, Town Clerk of Manchester, replied briefly.

In our last issue we briefly reported the appointments of **Mr. H. McNeil,** B.E., M.I.Mech.E., M.I.E.E., F.Inst.F., as managing director of Babcock & Wilcox, Ltd., and of **Mr. J. S. Robertson,** general manager, to the board of directors.

Mr. McNeil was born in New Zealand in 1904 and was educated at Canterbury University College, Christchurch, where he took the degree of B.E. of the University of New Zealand, in electrical engineering, in 1927, with concurrent professional training in the New Zealand Public Works Department. In 1929 he became an assistant engineer with the State Electricity Commission of Victoria, Australia, in the Coal Briquetting Department, and since that time his career has continued to be closely concerned with fuel technology.

He joined Babcock & Wilcox, Ltd., in London in 1931 as a service engineer, was appointed engineer in charge of peat briquetting in 1935 and deputy chief engineer in 1938. From 1940 to 1944 he was at the company's Renfrew Works engaged in matters relating to war production. In 1947 he was appointed general manager of the company, in London, becoming a director in 1950 and deputy managing director in 1953. He is also a director of Dewrance & Co., Ltd., and of the German, Spanish and Australian Babcock & Wilcox Companies. Since 1953 he has been a member of Council of the Institute of Fuel, was vice-president of that Institute from 1953 to 1956 and became president in 1957.

Mr. Robertson joined Babcock & Wilcox, Ltd., in 1935 after an apprenticeship with the General Electric Co., Ltd. After erection and service experience, he was on the staff of the company's Calcutta office until 1940, when he served with the London Scottish and the City of London Regiment of the Royal Fusiliers until 1945. From 1946 to 1950 he represented Babcock & Wilcox, Ltd., in New York and on his return to London was appointed manager of the Commonwealth Sales Department. He became assistant general manager in 1952 and general manager in 1953.

*Mr. H. McNeil*

*Mr. J. S. Robertson*

As we reported last week, **Sir Kenneth Hague,** M.I.Mech.E., M.I.E.E., whom Mr. McNeil succeeds as managing director, will continue to devote his services fully to the com-

pany in his position as deputy chairman. **Mr. C. H. Sparks,** who has retired from the board, continues to serve the company in the capacity of engineering consultant.

The annual ladies' night of the **Ipswich and District Electrical Association** will be held at the Royal Hotel, Clacton-on-Sea, Essex, on 14th November next.

From the end of this month **Mr. T. Herd,** for the last twelve years manager of the Birmingham office of Brook Motors, Ltd., will be transferred to London to take over as general manager of the London sales office. Mr. Herd served an apprenticeship with Brook Motors followed by 4½ years as sales engineer at Manchester. He was manager of Brook Motors' Newcastle-on-Tyne sales office from 1930 to 1946.

*Mr. T. Herd*

**Mr. L. F. Miller,** deputy chief contracts officer of the Central Electricity Generating Board, has been appointed chief purchasing and contracts officer of the Board.

*Mr. L. F. Miller*

Educated at the Leyton County High School and Northampton and Regent Street Polytechnic Institutes, Mr. Miller joined the Sales Department of W. T. Henley's Telegraph Works Co., Ltd., in 1929, and two years later, the Purchasing Department (Engineering Division) of Edmundsons Electricity Corporation, Ltd. After war service he was appointed secretary to several engineering committees of the British Standards Institution and on the reorganisation of the electricity supply industry he became senior assistant to the purchasing officer of the Eastern Electricity Board. In 1949, he joined the B.E.A. headquarters staff as analytical officer, Generation Construction Branch, subsequently becoming principal assistant contracts officer and then, in 1957, deputy chief contracts officer.

**Mr. J. D. Johnson** has been appointed a director of the London Electrical Co. (Blackfriars), Ltd. He has been with the company for eight years, first as assistant in the Buying Department, later as departmental manager, and more recently as general manager.

**Mr. D. Phillips,** A.R.I.B.A., has recently resigned from his staff appointment as architectural consultant with the A.E.I. Lamp & Lighting Co., Ltd., in order to practise privately. Mr. Phillips has spent some four years within the lighting industry. He joined the staff of the Lighting Department of the British Thomson-Houston Co., Ltd., upon his return from a research fellowship in the United States, and subsequently joined the A.E.I. Lamp & Lighting Co. As from 1st April he will practise as an architect and lighting consultant from 13, Oppidans Mews, London, N.W.3.

The **Edmundsons Group** reunion will be held on Friday, 11th April (6 for 7 p.m.), at the Café Monico, Piccadilly Circus, London, W.1. Mr. W. E. Brandreth will preside. Applications for tickets (24s each) should be made to Mr. F. T. Scribens, Electricity Council (Room 421), Winsley Street, London, W.1.

At the annual general meeting of the North Metropolitan Branch of the **Electrical Industries Benevolent Association** held on 21st February, at Northmet House, Southgate, London, N.14, the following were elected as honorary officers for the year:—Chairman, Mr. C. A. Baker; vice-chairman, Mr. D. W. Kaye; hon. secretary, Mr. A. T. Durbridge; and hon. treasurer, Mr. V. A. Colmer.

The following changes in Association representation on the Electrical Fair Trading Council have been announced:—Electric Lamp Industry Council: **Mr. A. E. Page** (General Electric Co., Ltd., and chairman of the E.L.I.C.) in place of **Mr. J. G. Christopher.** Electrical Wholesalers' Federation: **Mr. H. Riley** (John Riley & Sons (Electrical), Ltd.) in place of **Mr. A. B. Wildsmith.**

**Mr. H. S. Lewis,** B.Sc., A.M.I.E.E., has been appointed chief engineer of Chamberlain & Hookham, Ltd. Mr. Lewis joined the company in 1937 as an assistant in the Meter Testing Department and was later transferred to the Development Department. During the war he was attached to the Mine Design Department of the Admiralty and returned to the company in 1945. He was responsible for the design of a range of protective relays and, more recently, the application of epoxy resin to the company's products. He was appointed assistant chief engineer in 1948.

*Mr. H. S. Lewis*

At the annual dinner and dance of the **Eastern Electricity Board,** Essex Sub-Area (Millfield) Sports and Social Club held on 7th March, the chairman, Mr. E. A. Cullen, announced that a competition for the E.I.B.A. funds had produced over £70. The function

*At the dinner-dance of the E.E.B. Essex Sub-Area (Millfield) Sports and Social Club. Mr. and Mrs. W. J. Sageman and Mr. R. J. Honniball*

was attended by 220 club members and friends and the guest speakers were Mr. W. G. H. Gregson and Mr. T. C. Johnson. The secretary, Mr. C. E. Bostle, and the Committee, Messrs. Nicholls, Grew and Usher, were complimented on the excellent programme and fare provided.

**Mr. J. Keiser,** D.I.C., M.Sc.(Eng.), A.C.G.I., A.M.I.Mech.E., has been appointed education manager of Siemens Edison Swan, Ltd. He will co-ordinate the educational facilities throughout the company's factories, employing some 21,000 people. Mr. Keiser, who is a member of the Institute of Personnel Management, was previously education officer at Folland Aircraft, Ltd., for three years. Before that he was assistant education officer of Samuel Fox & Co., Ltd. He was educated at St. Paul's School and the City and Guilds College, and began his career as an apprentice with C. A. Parsons and Co., Ltd., later joining the steam turbine design office of that company.

*Mr. J. Keiser*

**Mr. R. L. Paice,** who has been sales director of the Igranic Electric Co., Ltd., Bedford, since 1948, has relinquished this position and **Mr. A. W. Page,** as sales manager, is now responsible for the home and export sales organisation. Mr. Paice, as a director of the company, will carry out special assignments of the Board.

**Mr. C. L. McAllister,** M.I.R.E., Associate I.E.E., has joined Airmec, Ltd., as head of the Sales Promotion Department. Mr. McAllister was for sixteen years concerned with the development of direction finding, navigation aid and air traffic control systems with the Air Ministry. During the war he served with the R.A.F. on Combined Staffs. In 1955 he went to the guided weapons division of the English Electric Co., Ltd., where he was responsible for technical liaison

with Ministry and Service staffs on guided weapon systems.

**Mr. Norman F. Badley,** who has been connected with the cable industry for many years, has been appointed managing director of Plastic Insulated Cables, Ltd., whose factory at Buckingham Avenue, Slough, is being equipped with modern plant for the manufacture of a range of thermoplastic cables and will be in production towards the end of April.

## OBITUARY

**Mr. R. Lee.**—The death occurred on 15th March of Mr. R. Lee, M.B.E., M.I.E.E., A.M.I.Mech.E., who until his retirement in 1953 had acted as sub-area liaison officer to the London Electricity Board. Mr. Lee, who was born in 1885 at Haslingden, Lancs., was educated at Blackburn Technical School and the Manchester College of Technology. After training in electricity supply at Darwen and Stockport he became, in 1920, deputy borough electrical engineer of the latter town. Then, after serving for a year as borough electrical engineer of St. Helens, he returned to Stockport in 1929 to become "chief" there. In 1931 he was appointed borough electrical engineer of St. Pancras, London, and held that post until nationalisation. Mr. Lee was a past-chairman of the Electrical Research Association.

*The late Mr. R. Lee*

**Lt.-Col. Mervyn O'Gorman.**—The death occurred on 16th March at the age of eighty-six, of Lt.-Col. Mervyn O'Gorman, C.B., D.Sc., F.C.G.I., M.I.C.E., M.I.E.E., M.I.Mech.E., Fellow R.Ae.S., consulting engineer, who after graduation at University College, Dublin, studied electrical engineering at the City and Guilds Institute. He later became an engineer with the Fowler Waring Cables Co., after which he was with the Western Electric and the Glover Cable Companies. For seven years he was associated with Mr. E. Cozens-Hardy in the development of suction gas engines. In 1909 he turned his attention to aeronautics becoming superintendent of H.M. Balloon Factory, Farnborough, and, in 1916, consulting engineer to the Director-General of Military Aeronautics. From 1920 his interests were mainly concerned with automobile problems.

He was a partner of Messrs. O'Gorman & Cozens-Hardy, and Swinburne, O'Gorman & Baillie, consulting engineers, and he had been a member of the Institution of Electrical Engineers since 1898 and was a past member of the Council of the Institution.

# *Parliamentary Report*

## Automatic Train Control

The delays in the introduction of automatic train control on British railways since 1920 when a special committee recommended its adoption on all lines was referred to by Mr. Philip Goodhart (Beckenham) in an adjournment debate in the House of Commons. He understood that there was a shortage of staff on British railways on the installation side for A.T.C. and asked if the Transport Commission would consider approaching the Area Electricity Boards? At least one senior executive of an Area Board had seen the new A.T.C. system in operation and had reported that his Board could handle the widespread introduction of this system.

For the Government, Mr. Nugent, Parliamentary Secretary, Ministry of Transport, said the 7½ years that the new system had taken to develop was by no means an excessive time. It had to operate in all weathers under heavy vibration, and infallibly, otherwise it was no use at all. It had been tried out on the four-rail electric system and would shortly be converted for the third-rail system too. The suggestion that the Electricity Boards could take over part of the work of installation conflicted with the general policy of the railways that their signal engineers never allowed outside contractors to do work where the lines were in operation.

## Cost of Hydro-Electric Schemes

Sir David Robertson asked if the Secretary of State for Scotland was aware that the twelve schemes completed by the North of Scotland Hydro-Electric Board were approved by Parliament at a cost of £21 million but actually cost £44 million and that the eleven schemes now in progress were estimated to cost £60 million whereas the estimated completion cost was now £98 million. In the interests of the Board as well as the people of Scotland he thought it desirable that the Board should stop and rest a while.

Mr. Niall Macpherson, Under-Secretary of State, said he did not think this followed. Undoubtedly, in the early stages, the Board had less experience of these matters than it had now, but the mere fact that the estimates had been exceeded in the past was not a reason for not going on with schemes at present.

In reply to Mr. Arthur Woodburn, he agreed that a great deal of the increase was due to changes in prices and the increased cost of interest.

Sir David Robertson said it was amazing that the country could afford excess expenditure of £60-£70 million on generation yet the Board was able to take advantage of a request made under the credit-squeeze policy to avoid expensive connections.

Mr. Macpherson: "You will be glad to hear that the Board intends to spend rather more in the current year than it did in the past year."

Asked by Mr. John MacLeod if a programme could be arranged for electricity connections in the more remote areas, Mr. Macpherson said no doubt the Board would take note of the suggestion.

## Farm Electrification Grants

Mr. Arthur Palmer asked the Minister of Agriculture whether he would arrange that grants for electrification under the Farm Improvement Scheme should be given in cases where the farmer makes his financial contribution towards the capital cost of the electricity service in quarterly instalments and not in one lump-sum down.

Mr. Godber, Parliamentary Secretary, said arrangements already existed for the payment of grant in such cases where the farmer paid by a limited number of instalments. The Minister was considering whether arrangements could be made for payment of grant where the farmer arranged to pay on a fixed-charge basis, without time-limit.

Mr. Palmer said that the present system, to a great extent, cancelled out much of the advantage that the improvement scheme was supposed to give to rural electrification.

Mr. Godber said that he realised that there were difficulties in some areas. The Minister was looking into this difficult point.

## Nationalised Industries' Finance

Mr. Simon, Financial Secretary to the Treasury, moving the second reading of the Nationalised Industries Loans Bill, said that it extended the limit of the powers given in the Finance Act, 1956, for advances to be made from the Exchequer to the electricity, gas, transport and airways undertakings up to a limit of £700 million by 31st March, 1958. The Bill would extend the period to 31st August, 1958. The balance expected to remain unexpended by 31st March was about £120 million, which was a little more than the seven Boards would need to draw on before the end of August. Future methods of financing these industries would be considered in the context of the general review of the Government's economic policy in the Budget on 15th April.

The Bill was read a second time.

## Designs Protection Bill

Interim protection for designs is provided under the Registered Designs Act, 1949 (Amendment) Bill promoted by Mr. A. Green (Conservative, Preston South), which was published last week. At present it takes from two to six months to register a design. A maximum fine of £50 is provided for a false claim of interim copyright.

# Railway Electrification Work

## COMPLETION OF 25 kV CABLE INSTALLATIONS

THE first two contracts involving the supply and installation of the new 25 kV concentric oil-filled cable designed and manufactured by W. T. Henley's Telegraph Works Co., Ltd., for the 50 c/s single-phase system of railway electrification have been completed by Henley's Contract Department engineers. Both contracts were at Stockport, near Manchester. The first, for the Central Electricity Generating Board, entailed the laying of feeders from Vernon Park substation to the British Transport Commission's Heaton Norris feeder station, and formed the first link to be installed between the national grid and the railways.

On this contract a run of two cables was installed over a route length of 3,200 yd, the main cables having a 0·25 sq in inner and a 0·21 sq in outer conductor and a 12 mm central oil duct with a single lead sheath, reinforcement, and anti-corrosion serving. At the Heaton Norris end, however, a 200ft length of duct necessitated a closing length of cable with 0·3 sq in inner and 0·25 sq in outer conductors being laid. Accompanying the two feeders was a run of two combined pilot and telephone cables made up of 6 × 7/·029in cores + 22 pair 1/·044in p.i.l.c. s.w.a. and s. cable. Between Vernon Park and the Stockport (Millgate) generating station, half-way along the route, a 2,100 yd run of 27 pair telephone cable with 1/·044in conductors was also laid.

At the Vernon Park end of the route the cables were terminated in outdoor vertical sealing ends in which, to bring out the outer conductor, it was necessary to add an extra insulator unit to the conventional arrangement. The inner conductor was terminated in the usual manner for hollow-core oil-filled cables; the wires of the outer conductor, after a stress cone had been applied at the lead sheath termination, were taken up and clamped over a spigot integral with the combined insulator ring and connector plate.

At the Heaton Norris end the terminations were in oil-immersed sealing ends. Compared with the outdoor sealing ends, the oil-immersed type have the added complication of both the switchgear tank and the cable gland being at earth potential. This problem was overcome by the addition of two insulator units, with the outer connection in this case being taken from the mid-point of the two added units.

The second contract which Henley's have carried out, for the British Transport Commission, required nearly 3¼ miles single run of 0·25/0·21 sq in 25 kV oil-filled concentric cable laid between the Heaton Norris feeder station, where the incoming feeder from the Central Electricity Generating Board provides the supply, and the Transport Commission's East Didsbury track-sectioning cabin.

The cable was laid direct in the ground and was protected by reinforced-concrete covers, except at several bridge positions where it was laid on steelwork in air. This cable was terminated at both ends in oil-immersed sealing ends. On each contract oil pressure is maintained by pressure tanks at both ends of the routes and alarm contact gauges.

The straight-through joints used to connect the lengths of 25 kV cable (which was manufactured in 500-600 yd lengths) were developed by Henleys along with the cable design.

The joints incorporate a conventional type hollow core oil-filled construction of appropriate dimensions for the inner conductor and dielectric. For the outer, a copper tube is applied over the central section of the inner screen and the wires from each side are jointed over the tube. Stress cones are applied at the lead sheath terminations and the re-applied dielectric over the outer conductor is in the form of an open paper tube supported by spacers.

*Laying Henley cable at Stockport for the electrification of the railways*

## Marine Motors and Generators

AT the request of the committee of the Institution of Electrical Engineers responsible for the regulations for the electrical equipment of ships, a new 37-page British Standard, B.S. 2949 : 1958, has been prepared which deals with marine electric motors and generators (other than those used for propulsion) and rotary convertors. The machines are rated at 1 h.p. 0·75 kW or 0·75 kVA per 1,000 r.p.m. or greater. The standard places no upper limit on the power rating. The machines dealt with are suitable for specified service conditions and may be assigned a continuous maximum rating or a short-time rating. The enclosures which may be employed are classified, and constructional and performance requirements are specified.

Alignment with B.S. 2613, "The Electrical Performance of Rotating Machinery," has been maintained wherever possible. The permissible temperature rises, based on a 50 deg C ambient cooling air temperature, generally give total temperatures for windings 5 deg C lower than those in B.S. 2613. Classes "A," "E" and "B" insulation only are recognised and for temperature rises a distinction is drawn between totally enclosed machines and machines with other types of enclosure.

An appendix sets out the kind of information that should be given with any inquiry or order.

It is hoped that B.S. 2949 will prove a useful addition to the standards mentioned in the I.E.E. Regulations for the Electrical Equipment of Ships. Preparation of a British Standard for propulsion machines for marine application is now under consideration.

Copies of B.S. 2949 : 1958 may be obtained from the Publications Department, British Standards Institution, 2, Park Street, London, W.1, price 8s 6d.

# Electrical Engineers' Exhibition

## OVER 400 EXHIBITORS AT EARLS COURT DISPLAY

IT is estimated that over 40,000 domestic, industrial and commercial electrical products will be on display at the 1958 Electrical Engineers' Exhibition to be held at Earls Court, London, from Tuesday to Saturday, 25th to 29th March. Organised by the Association of Supervising Electrical Engineers, the exhibition will be officially opened by Sir David Eccles, President of the Board of Trade. It is the seventh of its kind and now ranks as one of the largest in this country with a record number of over 400 manufacturers, associations and organisations taking part.

Last year 65,000 attended the Exhibition and this figure included hundreds of buyers from more than sixty countries. Overseas buyers will again be well catered for and specialist engineers will be in attendance to answer inquiries. There will also be a large staff of technical guides, interpreters and secretaries.

A modern lighting display will illuminate the entrance foyer and the roof of the main hall, while the entrance hall will be fitted with overhead infra-red heaters. During the five days of the Show it is estimated that the electricity consumption will be more than three million kWh and more than a million yards of wire and cable will be employed in special electrical installations.

The demand for space has necessitated further expansion on the first floor (all of which will be in use for this year's display) and the total ground and first floor areas occupied cover 450,000 sq ft. More than usual attention has been paid to the layout of the exhibitors' stands and on the centre gangways they are arranged so as to permit the visitor to keep the whole exhibition in view. In addition to escalators the first floor can also be reached by a central staircase, designed by Dexion, Ltd., built on slotted steel angle.

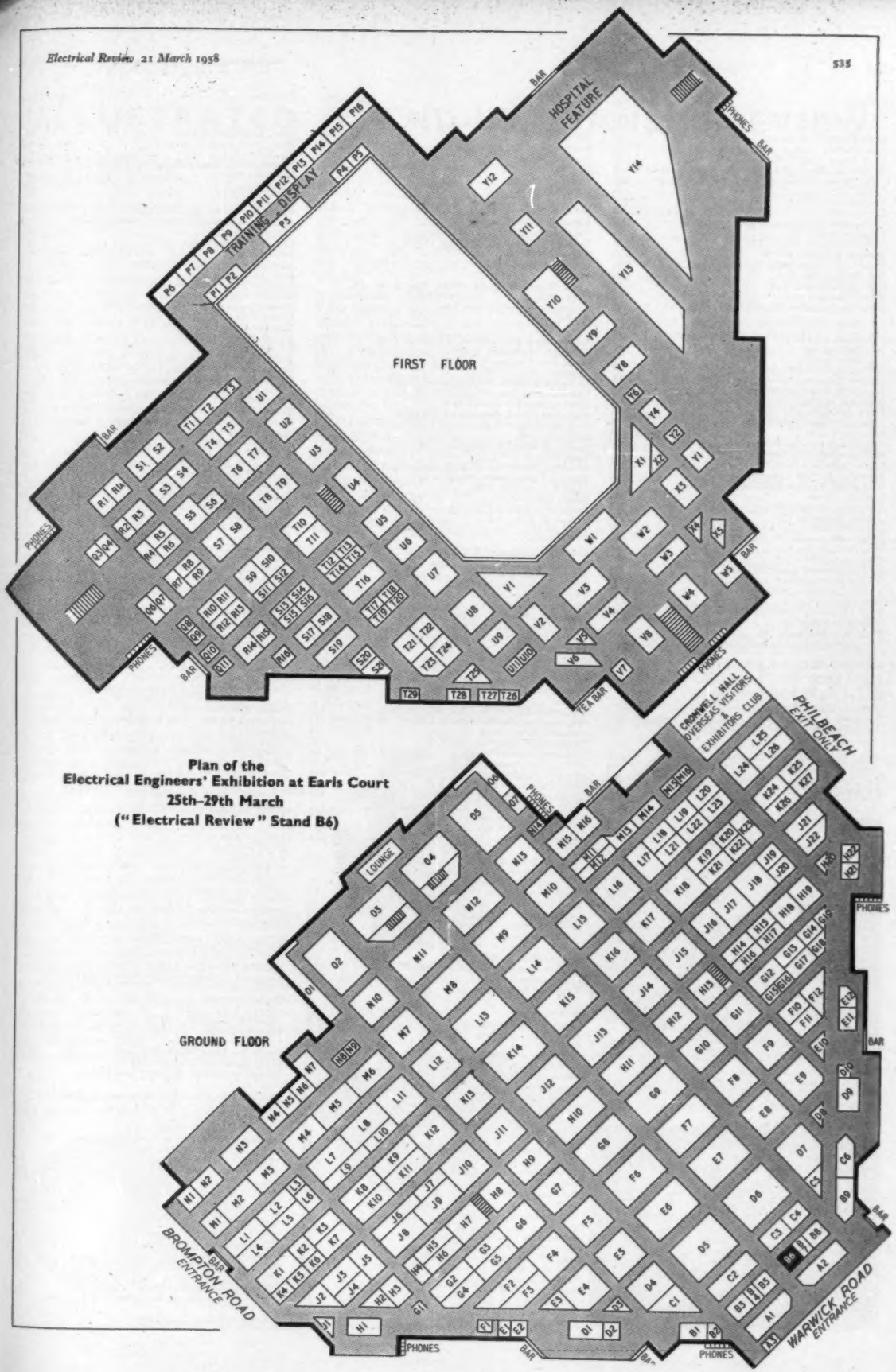
The emblem of the Exhibition will be " Mr. Pylon " who will be featured on a scenic background measuring 160ft by 30ft. Apart from being illuminated he will also be animated, which is probably a fair description of the Show itself. While the exhibits to be seen cover a very wide field, ranging from generators and distribution equipment to the actual installation materials, wires and cables, lighting fittings, instruments and other industrial and domestic equipment, attention is particularly drawn to a special section devoted to " Electricity in Hospitals." Supported by the leading manufacturers, this display occupies some 8,000 sq ft on the first floor and will include a completely fitted operating theatre with all the latest devices.

A large space is also given to methods of training and educating apprentices and to giving information on careers in the industry. As well as the A.S.E.E. the following are co-operating in this section :—Electrical Association for Women, E.M.I. Institutes, National Inspection Council, Royal Air Force, Royal Navy, City and Guilds of London Institute, Institution of Electrical Engineers and several Polytechnics. A giant electric motor, claimed to be one of the largest ever seen in this country, will be on show. Weighing 17 tons, it will be mounted on a trailer unit and because of its size and weight the motor (Laurence, Scott & Electromotors, Ltd.) will be displayed in the forecourt of Earls Court. In contrast, one of the smallest items to be exhibited is a transformer the size of a wedding ring.

As in previous years two silver plaques will be awarded for the best industrial and domestic products that have been marketed during the past twelve months. Entries will be assessed on the basis of originality, design, construction, workmanship, labour-saving attributes, and ease of maintenance and operation. After the official opening at noon next Tuesday, the Exhibition will be open on subsequent days, to the trade only, from 10 a.m. to 7 p.m., except Wednesday, when it will remain open until 9 p.m.

| *Exhibitor* | *Stand No.* |
|---|---|
| **Ac-Delco Division of General Motors, Ltd.** | H7 |
| A.C. Industries, Ltd. | T12 |
| A.E.I. Lamp and Lighting Co., Ltd. | J12 |
| Aerialite, Ltd. | E5 |
| Aero Research, Ltd. | T6 |
| Agro Electrical Co., Ltd. | D3 |
| Aircraft-Marine Products (Gt. Britain), Ltd. | T22 |
| Albright (Engineers), Ltd. | T29 |
| Allen West & Co., Ltd. | E7 |
| Alorite, Ltd. | G10 |
| Arrell Electrical Accessories, Ltd. | M16 |
| Arrow Electric Switches, Ltd. | L7 |
| Ashcroft Tools, Ltd. | G14 |
| Ashley Accessories, Ltd. | K11 |
| Association of Supervising Electrical Engineers | P3 |
| Astral Equipment, Ltd. | H15 |
| Astral Switchgear, Ltd. | K11 |
| Atlas Lighting, Ltd. | K16 |
| Austinlite, Ltd. | R3 |
| **Backer Electric Co., Ltd.** | E11 |
| Bakelite, Ltd. | K26 |
| Baldwin (H. J.) & Co., Ltd. | J21 |
| Baldwin & Francis, Ltd. | S7 |
| Bayliss, Jones & Bayliss, Ltd. | Y4 |
| Beckett & Parker, Ltd. | B2 |
| Belling & Co., Ltd. | W2 |
| Belmos Co., Ltd. | N12 |
| Benjamin Electric, Ltd. | L14 |
| Berry's Electric, Ltd. | V8 |
| Bertram Thomas (Engineers), Ltd. | O2 |
| Besson & Robinson, Ltd. | U8 |
| Best Products, Ltd. | L18 |
| Bill Switchgear, Ltd. | M8 |
| B.K.B. Electric Motors, Ltd. | L24 |
| Blackwell (F. C.) & Co., Ltd. | L3 |
| Bolton (Thomas) & Sons, Ltd. | H18 |
| Bonar, Long & Co., Ltd. | S15 |
| Borough Polytechnic | P15 |
| Bourner (F. H.) & Co. (Engineers), Ltd. | O7 |
| Bowker (S. O.), Ltd. | M12 |
| Bowthorpe Electric Co., Ltd. | U7 |
| Bray (Geo.) & Co., Ltd. | J1 |
| British Central Electrical Co., Ltd. | J17 |
| British Electrical & Allied Industries Research Association | C3 |
| British Electrical Development Association | C4 |
| British Electrical Repairs, Ltd. | G6 |
| British Electric Resistance Co., Ltd. | H22 |
| British Foreign & Colonial Automatic Light Controlling Co., Ltd. | R15 |
| British Insulated Callender's Cables, Ltd. | G9 |
| British Klockner Switchgear, Ltd. | G10 |
| British Power Transformer Co., Ltd. | H22 |
| British Standards Institution | P1 |
| British Switchgear Corporation, Ltd. | U11 |
| British Thomson-Houston Co., Ltd. | J12 |
| British Vacuum Cleaner & Engineering Co., Ltd. | W3 |
| Britmac Electrical Co., Ltd. | D9 |
| Brook Motors, Ltd. | N13 |
| Brookhirst Switchgear, Ltd. | K1 |
| Browning's Electric Co. Ltd. | K13 |
| Brush Electrical Engineering Co., Ltd. | D6 |
| Bryce Electric Construction Co., Ltd. | N10 |
| Bullers, Ltd. | W5 |
| Bulpitt & Sons, Ltd. | L24 |
| Burco, Ltd. | S2 |
| Burgess Products Co., Ltd. | N1 |
| **Canning (W). & Co., Ltd.** | U1 |
| Carter & Co. (Nelson), Ltd. | Q11 |
| Cary (William E.), Ltd. | J19 |
| Cayson Electrics, Ltd. | J7 |
| Central Electricity Generating Board | C2 |
| Central Electricity Generating Board (Training Feature) | P12 |
| Central Engineering Works (Hastings), Ltd. | J20 |
| Chance-Londex, Ltd. | R3 |
| Chapman & Hall, Ltd. | D8 |
| Chilton Electric Products, Ltd. | L15 |
| Chloride Batteries, Ltd. | K24 |
| City & Guilds of London Institute | P14 |
| Clang, Ltd. | D1 |
| Clare Instrument Co. | E1 |
| Clarke (H.) & Co. (Manchester), Ltd. | S8 & N8 |
| Cole (E. K.), Ltd. | F11 |
| Contactum, Ltd. | K22 |
| Controlled Heating Units (London), Ltd. | R7 |
| Copper Development Association | T5 |
| Courtney Pope (Electrical), Ltd. | L13 |
| Crabtree (J. A.) & Co., Ltd. | L17 |
| Creators, Ltd. | S12 |
| Cressall Manufacturing Co., Ltd. | U5 |
| Critchley Bros., Ltd. | U10 |
| Crompton Parkinson, Ltd. | H11 |
| Crossland (R. & A. G.), Ltd. | K25 |
| Crosslands (Rugeley), Ltd. | K25 |
| Crypton Equipment, Ltd. | D5 |

(*Continued on page 536*)




**Plan of the**
**Electrical Engineers' Exhibition at Earls Court**
**25th–29th March**
**("Electrical Review" Stand B6)**

(continued on page 536)

| Exhibitor | Stand No. |
|---|---|
| **Dale Electric (Export), Ltd.** | T25 |
| Dale Electric (Yorkshire), Ltd. | T25 |
| Davis Sheet Metal Engineering Co., Ltd. | L10 |
| De La Rue (Thomas) & Co., Ltd. | S3 |
| Delta Technical Services, Ltd. | E2 |
| Dennis (G. P.), Ltd. | G4 |
| Dex Industries, Ltd. | N14 |
| Dexion, Ltd. | Staircase Stand |
| "Diamond H" Switches, Ltd. | K2 |
| Dimplex, Ltd. | J6 |
| Donovan Electrical Co., Ltd. | G5 |
| Dorman & Smith, Ltd. | G10 |
| Dowsing Co. (Electrical Manufacturers), Ltd. | R15 |
| D.P. Battery Co., Ltd. | K4 |
| D.R. Illuminations, Ltd. | E5 |
| D.S. Plugs, Ltd. | G10 |
| Dubilier Condenser Co. (1925), Ltd. | M13 |
| **Easipower, Ltd.** | R2 |
| E.F. Electric, Ltd. | H17 |
| Ega Electric, Ltd. | Q3 |
| Ekco-Ensign Electric, Ltd. | D7 |
| Electric Construction Co., Ltd. | F8 |
| Electric & Ordnance Accessories Co., Ltd. | R12 |
| *Electrical and Radio Trading* | A3 |
| Electrical Apparatus Co., Ltd. | G3 |
| Electrical Association for Women | P4 |
| *Electrical Energy* | B4 |
| Electrical Industries Benevolent Association | P11 |
| *Electrical Industries Export* | B3 |
| *Electrical Journal* | B8 |
| Electrical Remote Control Co., Ltd. | T27 |
| **Electrical Review Publications, Ltd.** | B6 |
| *Electrical Times* | B5 |
| Electrical Trades Union | P13 |
| Electro Automat, Ltd. | R8 |
| Electro Dynamic Construction Co., Ltd. | L19 |
| Electro-Mechanical Manufacturing Co., Ltd. | H1 |
| Electro Methods, Ltd. | R16 |
| *Electronic Engineering* | B4 |
| Elliott Brothers (London), Ltd. | M5 |
| Ellison (George), Ltd. | M7 |
| E.M.B. Co., Ltd. | M15 |
| EMP Electric, Ltd. | T24 |
| E.M.S. Electrical Products, Ltd. | F12 |
| Enfield Cables, Ltd. | H13 |
| Engel & Gibbs, Ltd. | K23 |
| Engineering Industries Assn. Group Apprenticeship | P16 |
| English Clock Systems, Ltd. | L8 |
| English Electric Co., Ltd. | Y8 & N11 |
| Erma, Ltd. | T14 |
| Erskine, Heap & Co., Ltd. | O4 |
| Everett, Edgcumbe & Co., Ltd. | N12 |
| Evershed & Vignoles, Ltd. | B1 |
| Expanded Metal Co., Ltd. | U5 |
| **Falk, Stadelmann & Co., Ltd.** | K15 |
| Fancy Metal Goods, Ltd. | T8 |
| Fenton, Byrn & Co., Ltd. | N3 |
| Ferguson Pailin, Ltd. | G11 |
| Ferranti, Ltd. | M9 |
| Fibreglass, Ltd. | T17 |
| Field (H. W.) & Son, Ltd. | R4 |
| Fitzgibbon & Murray, Ltd. | F1 |
| Formica, Ltd. | S3 |
| Forrest (George), Ltd. | K16 |
| Foster Transformers, Ltd. | D5 |
| Fractional H.P. Motors, Ltd. | J20 |
| Friedland (V. & E.), Ltd. | C6 |
| Fuller Electric, Ltd. | K18 |
| **General Electric Co., Ltd.** | W1 & F7 |
| General Post Office (Telex Service) | O6 |
| General Post Office (Training Feature) | P8 |
| Gent & Co., Ltd. | L22 |
| Glover (W. T.) & Co., Ltd. | J9 |
| Gosheron (John) & Co., Ltd. | S1 |
| Great Bridge Foundry Group | Y9 |
| Gulf Oil (Gt. Britain), Ltd. | H8 |
| G.W.B. Furnaces, Ltd. | G13 |
| **Hackbridge & Hewittic Electric Co., Ltd.** | O2 |
| Harris & Sheldon (Electrical), Ltd. | J15 |
| Hawke Cable Glands, Ltd. | T19 |
| Hawkins (L. G.) & Co., Ltd. | J4 |
| Heatovent Electric, Ltd. | G17 |
| Heatrae, Ltd. | N4 |
| Heayberd (F. C.) & Co., Ltd. | T13 |
| Hedin, Ltd. | F10 |
| Heenan & Froude, Ltd. | T2 |
| Hellermann, Ltd. | U7 |
| Henley's (W. T.) Telegraph Works Co., Ltd. | J14 |
| Herbert Publishing Co., Ltd. | B7 |
| Higgs Motors, Ltd. | T1 |
| Hilmor, Ltd. | Y2 |
| Hirst Electronic, Ltd. | L23 |
| Hollman (Oswald), Ltd. | Y11 |
| Holophane, Ltd. | H16 |
| Homeshade Co., Ltd. | U6 |
| Honeywell-Brown, Ltd. | V4 |
| Hoover, Ltd. | X1 |
| Hotpoint Electric Appliance Co., Ltd. | D4 |
| Hume Atkins & Co., Ltd. | S14 |
| Hunt (A. H.) (Capacitors), Ltd. | O1 |
| **Igranic Electric Co., Ltd.** | U4 |
| Imhof (Alfred), Ltd. | Q6 |
| Imperial Chemical Industries, Ltd. | V1 |
| Industrial Tapes, Ltd. | N9 |
| Institution of Electrical Engineers | P2 |
| Insuloid Manufacturing Co., Ltd. | Q4 |
| Ioco, Ltd. | R13 |
| Irish Cables, Ltd. | S16 |
| Isopad, Ltd. | G16 |
| **Jackson Electric Stove Co., Ltd.** | R14 |
| Jeary Electrical Co., Ltd. | K10 |
| Johnson, Matthey & Co., Ltd. | V7 |
| Johnson (Richard) & Nephew, Ltd. | L16 |
| Johnson & Phillips, Ltd. | E8 |
| Jones & Stevens, Ltd. | T26 |
| **Kent Bros. Electric Wire Co. & E. H. Phillips, Ltd.** | J3 |
| Kilpatrick (James) & Son, Ltd. | G18 |
| Klaxon, Ltd. | L2 |
| **Laboratory Equipment (London), Ltd.** | Y6 |
| Ladybird Appliances, Ltd. | S6 |
| Lancashire Dynamo Group | D5 |
| Langley London, Ltd. | N15 |
| Laurence, Scott & Electromotors, Ltd. | L11 |
| Lee Guinness, Ltd. | R10 |
| Lawden Metal Products, Ltd. | L6 |
| Light and Power Accessories Co., Ltd. | K27 |
| Line Equipment, Ltd. | U7 |
| Lintronic, Ltd. | T3 |
| Liverpool Electric Cable Co., Ltd. | L4 |
| Londex, Ltd. | J5 |
| London Electric Wire Co. & Smiths, Ltd. | L4 |
| London Transformer Products, Ltd. | N7 |
| Long & Crawford, Ltd. | T16 |
| Lord's Controls, Ltd. | T12 |
| Lossos (M. & J.) & Co., Ltd. | T15 |
| Lumitron, Ltd. | R9 |
| Lyon (Arthur) & Co. (Engineers), Ltd. | H19 |
| **Maclaren (Robert) & Co., Ltd.** | H9 |
| McGeoch (William) & Co., Ltd. | F9 |
| *Machinery Lloyd* | B3 |
| Magicook Appliances, Ltd. | X2 |
| Magneta Time Co., Ltd. | W3 |
| Magnetic and Electrical Alloys, Ltd. | J11 |
| Major Equipment Co., Ltd. | K9 |
| Mallory Metallurgical Products, Ltd. | V7 |
| Mantel Metalworkers, Ltd. | K8 |
| Marbourn, Ltd. | N6 |
| Marryat & Place, Ltd. | G15 |
| Martindale Electric Co., Ltd. | H3 |
| M. & C. Switchgear, Ltd. | L1 |
| M.C.B. Co. (Manchester), Ltd. | G19 |
| Mersey Cable Works, Ltd. | K20 |
| Metropolitan-Vickers Electrical Co., Ltd. | Q3 |
| Metway Electrical Industries, Ltd. | G2 |
| Micanite & Insulators Co., Ltd. | U3 |
| Midland Coil Winding Co., Ltd. | J15 |
| Midland Electric Manufacturing Co., Ltd. | E6 |
| Midland Silicones, Ltd. | L20 |
| Minerva Mouldings, Ltd. | L26 |
| M.K. Electric, Ltd. | M10 |
| Monsanto Chemicals, Ltd. | S20 |
| Morecambe Electrical Equipment Co., Ltd. | S10 |
| Morphy-Richards, Ltd. | H15 |
| M.T.E. Control Gear, Ltd. | Y10 & K21 |
| Mycalex & T.I.M., Ltd. | G14 |
| **Nalder Bros. & Thompson, Ltd.** | K17 |
| National Inspection Council for Electrical Installation Contracting | P5 |
| Nettle Accessories, Ltd. | E5 |
| New Day Electric (Sales), Ltd. | F3 |
| Newman Industries, Ltd. | M2 |
| Nife Batteries | J22 |
| Northern Polytechnic | P10 |
| **Oliver Pell Control, Ltd.** | U8 |
| Osborn Manufacturing Co., Ltd. | T21 |
| Otter Controls, Ltd. | T20 |
| Ottermill Switchgear, Ltd. | M3 |
| **P.A.M., Ltd.** | F3 |
| P. & B. Engineering Co., Ltd. | T28 |
| Panalec (Gt. Britain), Ltd. | T18 |
| Parmeko, Ltd. | R1 |
| Parmiter, Hope & Sugden, Ltd. | A1 |
| Partridge, Wilson & Co., Ltd. | K3 |
| Patterncrafts, Ltd. | Y9 |
| Permali, Ltd. | J18 |
| Permanoid, Ltd. | M16 |
| Philips Electrical, Ltd. | K14 |
| Pirelli-General Cable Works, Ltd. | V2 |
| Plessey Co., Ltd. | S9 |
| Poles, Ltd. | S5 |
| Porter Electrical Products, Ltd. | D10 |
| Power Centre Co., Ltd. | K12 |
| Power Connectors, Ltd. | E12 |
| Process Control Gear, Ltd. | X5 |
| Pyrotenax, Ltd. | J16 |
| **Ranton & Co., Ltd.** | C5 |
| Rawlplug Co., Ltd. | M4 |
| Reason Manufacturing Co., Ltd. | E7 |
| Record Electrical Co., Ltd. | B9 |
| Redcliffe Industries (Bristol), Ltd. | U8 |
| Remploy, Ltd. | R6 |
| Revo Electric Co., Ltd. | H9 |
| Reyrolle (A.) & Co., Ltd. | M6 |
| Rheostatic Co., Ltd. | E4 |
| Robinson (D.) & Co. | S13 |
| Rodene Electrical Co. | S13 |
| Rolco Engineering, Ltd. | V5 |
| Ross Courtney & Co., Ltd. | F3 |
| Rotaprint, Ltd. | Y1 |
| Rowlands Electrical Accessories, Ltd. | F4 |
| Royal Air Force | P6 |
| Royal Navy | P7 |
| **Sams Electrical London, Ltd.** | Q9 |
| Sanders (Wm.) & Co. (Wednesbury), Ltd. | J2 |
| Sangamo Weston, Ltd. | A2 |
| Sankey (Joseph) & Sons, Ltd. | J10 |
| Santon, Ltd. | M11 |
| Scholes (George H.) & Co., Ltd. | E9 |
| Scottish Cables, Ltd. | D2 |
| Sheffield Steel Products, Ltd. | U8 |
| Siemens Edison Swan, Ltd. | G8 |
| Siemens-Schuckert (Gt. Britain), Ltd. | N10 |
| Sillett & Cooksey, Ltd. | Y9 |
| Simplex Electric Co., Ltd. | J13 |
| Slough Metals, Ltd. | H20 |
| S.L.R. Electric, Ltd. | S18 |
| Small Electric Motors, Ltd. | K19 |
| Smith (Frederick) & Co. | L4 |
| Smith (Herman) Smithlite, Ltd. | T9 |
| Smith Hobson, Ltd. | Q10 |
| Smith Meters, Ltd. | Q7 |
| Smiths Clocks & Watches, Ltd. | L8 |
| Smiths Industrial Instruments, Ltd. | L8 |
| South Wales Switchgear, Ltd. | J8 |
| Southern Areas Electric Corporation, Ltd. | F3 |
| Square D, Ltd. | S4 |
| S.R.K. Deo & S.L.N. Mining Industries | Q13 |
| Standard Telephones & Cables, Ltd. | F6 |
| Statter (J. G.) & Co., Ltd. | D5 & L26 |
| Steel Equipment Co., Ltd. | T4 |
| Sterling Cable Co., Ltd. | U2 |
| Stone-Chance, Ltd. | R3 |
| Stream-Line Filters, Ltd. | T11 |
| Strong Electric Corporation (Gt. Britain), Ltd. | S21 |
| Submarine Cables, Ltd. | J11 |
| Suffolk Iron Foundry (1920), Ltd. | T23 |
| Sumo Pumps, Ltd. | R3 |
| Sunvic Controls, Ltd. | F5 |
| Switchgear & Cowans, Ltd. | S19 |
| Symons (H. D.) & Co., Ltd. | H5 |
| Synchronome Co., Ltd. | L5 |
| Synthetic Carbon & Engineering Co., Ltd. | G1 |
| **Tate Engineers, Ltd.** | R1A |
| Taylor Electrical Instruments, Ltd. | S17 |
| Taylor (George E.) & Co. (London), Ltd. | K6 |
| Taylor Tunnicliff & Co., Ltd. | R12 |
| Taylor Tunnicliff (Refractories), Ltd. | R12 |
| Telcon Magnetic Cores, Ltd. | J11 |
| Telcon Metals Group | J11 |
| Telegraph Construction & Maintenance Co., Ltd. | J11 |
| Tessier (V.), Ltd. | Q8 |
| Tetra Engineering Co., Ltd. | K5 |
| Thames Wire & Cable Co., Ltd. | S11 |
| Thermat, Ltd. | J21 |
| Thermodare (Great Britain) | N2 |
| Thermostatic Controls Co. | R7 |
| Thomas (Frederick) & Co., Ltd. | V6 |
| Thorn Electrical Industries, Ltd. | K16 |
| Thorpe (F. W.), Ltd. | K7 |
| T.M.C.-Harwell (Sales), Ltd. | H14 |
| Toolpro, Ltd. | J11 |
| Trade Intelligence, Ltd. | B3 |
| Tricity Cookers, Ltd. | K16 |
| Triplex Foundry, Ltd. | Y9 |
| Troughton & Young, Ltd. | H12 |
| Tudor Accumulator Co., Ltd. | H4 |
| Tufnol, Ltd. | L12 |
| Turners Asbestos Cement Co., Ltd. | U9 |
| Tyrad Electric, Ltd. | H12 |
| **Uni-Tubes, Ltd.** | E10 |
| **Vactite Wire Co., Ltd.** | L4 |
| Vanguard Engineering Co. (P. H. Fitzgerald & Co., Ltd.) | R5 |
| Varilectric, Ltd. | C1 |
| Venner, Ltd. | N1 |
| Venner Electronics, Ltd. | N1 |
| Vent-Axia, Ltd. | W4 |
| Veritys, Ltd. | T10 |
| Victor Products (Wallsend), Ltd. | T7 |
| Volex Electrical Products, Ltd. | F2 |
| Vowles Aluminium Foundry Co., Ltd. | Y9 |
| **Walker (W. G.) & Co. (Engineers), Ltd.** | J19 |
| Wallacetown Engineering Co., Ltd. | X3 |
| Walsall Conduits, Ltd. | G7 |
| Wandleside Cable Works, Ltd. | S16 |
| Wandsworth Electrical Manufacturing Co., Ltd. | E3 |
| Watford Electric & Manufacturing Co., Ltd. | G12 |
| Watliff Co., Ltd. | M1 |
| Weir Electrical Instrument Co., Ltd. | H21 |
| Westinghouse Brake and Signal Co., Ltd. | H10 |
| Westwood Switchgear, Ltd. | K9 |
| Whipp & Bourne, Ltd. | M14 |
| Wiggin (Henry) & Co., Ltd. | H2 |
| Wilcox (Edward) & Co., Ltd. | V3 |
| William White (Switchgear), Ltd. | L21 |
| Wimbledon Technical College | P9 |
| Wireohms, Ltd. | J21 |
| Woden Transformer Co., Ltd. | L9 |
| **Yorkshire Imperial Metals, Ltd.** | O5 |
| Yorkshire Switchgear & Engineering Co., Ltd. | H1 |
| **Zenith Electric Co., Ltd.** | X4 |

# ILLUSTRATED STAND-BY-STAND PREVIEW

**AC-Delco Division of General Motors, Ltd.,** Dunstable, Beds.—**Stand H.7.**—Delco f.h.p. motors of various sizes and types including capacitor start or split phase, rotor-stator, universal and l.v. d.c. motors.

**A.C. Industries, Ltd.,** 15, Victoria Avenue, Camberley, Surrey.—**Stand T.12.**—Transformers, chokes, saturable reactor control gear, l.v. isolation transformers and a new flash tester with terminals up to 3 kV.

**A.E.I. Lamp & Lighting Co., Ltd.,** Crown House, Aldwych, London, W.C.2. —**Stand J.12.**—Of special interest is a new submersible fluorescent fitting used for dock lighting, navigational lighting, etc. Fluorescent fittings demonstrate how any fluorescent lighting requirements may be met with standard equipment. "Invertrunking," universal trunking and shallow trunking are also shown. Samples of standard module fittings include a new design for shallow cavities. The "Mazda" exhibit includes lamps with special applications among which are a quartz infra-red and a 2 kW xenon lamps.

**Aerialite, Ltd.,** Castle Works, Stalybridge, Cheshire.—**Stand E.5.**—A comprehensive range of cables and flexibles for all domestic and industrial power and lighting projects includes "Ashton" v.r.i., t.r.s., etc., plastic insulated types and a number of special purpose cables. Cables developed for floor warming and brilliantly coloured appliance flexibles are among new products. The "Ashathene" display contains a representative selection of standard single and double wire armoured cables, among which are polythene and p.v.c. insulated power cables for voltages up to and including 660 V. A special feature is a miniature communal multipoint aerial network as used for flats, hotels, etc.

**Aero Research, Ltd.,** Duxford, Cambridge.—**Stand T.6.**—"Araldite" epoxy resins; gravity casting resins for transformers and insulators; a selection of potted components; and glasscloth laminates using both hot and cold cured resins.

**Agro Electrical Co., Ltd.,** 60–66, Wardour Street, London, W.1.—**Stand D.3.**—New products include a Bakelite buzzer with a distinctive note above ordinary noise level and a competitively priced under-dome bell.

**Aircraft-Marine Products (Great Britain), Ltd.,** 60, Kingly Street, Regent Street, London, W.1.—**Stand T.22.**—Solderless wiring devices include preinsulated terminals, terminals for solid wire, special pins, plugs, disconnects, quick disconnects and simplified wiring devices. Of special interest are the tooling exhibits which feature dot and colour coding, "Certi-Crimp" ratchets, terminal stops and guides, wire positioners and other special pressure connection devices. An automatic machine applying terminals in strip form is demonstrated.

**Albright (Engineers), Ltd.,** 125, Red Lion Road, Tolworth, Surbiton, Surrey.—**Stand T.29.**—D.c. solenoid switches and contactors for electric vehicles; l.v. and h.v. switches and switch panels; selector switches for airborne equipment; and commutators and slip rings. New products include a 100 A "vacuumised" solenoid switch.

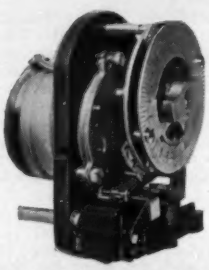
**Allen West & Co., Ltd.,** Brighton, 7.—**Stand E.7.**—From a range of standard motor starters and accessories for all industrial and flameproof applications the company displays oil-break hand-operated gear, crane control gear, automatic contactor multi-panel switchboards and a h.v. contactor starter, together with class "OB" e.h.v. distribution switchgear. Specially displayed are a multi-starter panel having plug-in components throughout; a grouped starter switchboard embodying multi-tier construction; and a 6·6 kV contactor type equipment (a single 275 h.p. direct-switching starter, with on load isolator). For crane and steelworks control gear there are weatherproof drum-type and cam-type master controllers, limit switches and also a combined operator's seat and controller unit. Hand-operated oil-break gear of down-to-floor construction is demonstrated.

**Arrow Electric Switches, Ltd.,** Hanger Lane, Ealing, London, W.5.—**Stand L.7.** —A new line of control gear which combines features not previously available in one unit is shown. Basically the unit consists of a heavy duty direct-acting magnetic relay, carrying a contact rating of 15 A (non-reactive) at 600 V a.c. It is available with up to 8 poles, which can be either all normally open, all normally closed, or any combination of normally open and normally closed. It can be supplied with a.c. operating coils suitable for supply from all voltages up to 550 V at 50 and 60 c/s. Other exhibits include magnetic contactors; push-button stations and direct-on-line starters up to 10 h.p.; multi-circuit rotary packet switches; and a number of new types of rotary and tumbler switches.

**Ashcroft Tools, Ltd.,** Ashcroft Road, Cirencester, Glos.—**Stand G.14.**—Air circulators and fan heaters for domestic, office and shop use.

**Ashley Accessories, Ltd.,** Ulverston, Lancs.—**Stand K.11.** — Accessories for lighting and power installations include adaptors, switched lampholders, fluorescent lamp accessories, ceiling roses, junction boxes, appliance connectors, bell transformers and terminal blocks. A special display of accessories for 13 A installations includes shuttered socket outlets for plaster depth mounting, fused plugs, fused and shuttered socket adaptors and selective entry spur junction boxes.

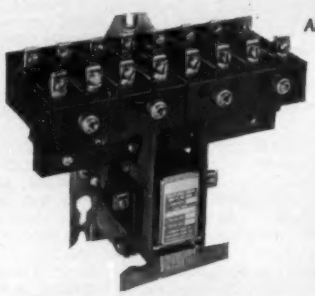
**Astral Switchgear, Ltd.,** Alma Road, Enfield, Middlesex.—**Stand K.11.**—Low voltage distribution equipment; fused switchgear K.E.M.A. 35 MVA tested, of



*Type G.103 time switch (Automatic Light Controlling Co., Ltd.)*

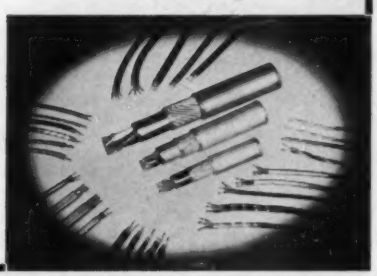
*Allen West multi-tier contactor board*

*AC-Delco rotor-stator unit for incorporation into hermetically-sealed refrigeration units*



*Arrow 600 V 15 A multi-pole relay*

*Sectionalised cables and flexibles from the Aerialite range*



unit and flush types in 60, 100 and 300 A ratings; switchboards; control cubicles; instrumentation panels; fuseboards, etc.

**Atlas Lighting, Ltd.,** 233, Shaftesbury Avenue, London, W.C.2.—**Stand K.16.**—Additions to the range of "Atlas" lighting equipment are shown as well as a number of recently introduced items from the George Forrest range. The "Sylvalume" ceiling, a new system of fluorescent lighting, is also presented. Other exhibits include the "Atlantic" fluorescent fittings, based on a standard chassis design in 8, 5, 4 and 2ft sizes and offering nearly 400 different fittings for commercial and industrial application; a range of incandescent display lighting fittings which comprises four basic units for horizontal, vertical, flush or surface mounting, in different sizes to take lamps from 60 to 300 W; the "Domino" fluorescent system; "Modulite" fluorescent troffer fittings, with new diffuser attachments; the GIQ "Wafer" fitting, developed for use where recessed lighting is desirable but lack of space prevents recessing the chassis; the "Social" range for domestic applications; and the "Kitchenlight" 4ft 40 W fluorescent fitting.

**Backer Electric Co., Ltd.,** Fitzwilliam Road, Rotherham, Yorks.—**Stand E.11.**—The advantages of using tubular sheathed heating elements as a compact, efficient and economical heat source for a wide variety of industrial processes are illustrated. Examples of elements include industrial immersion heaters, groove embedded platten and die heaters, roll pre-heaters, infra-red hood assemblies, turbine bolt heaters, etc. For catering requirements there are exhibits of heavy duty radiant hotplates, griddle, grill and deep fat fryer elements, and domestic boiling plate, oven and percolator elements.

**Bakelite, Ltd.,** 12–18, Grosvenor Gardens, London, S.W.1.—**Stand K.26.**—The company is exhibiting "compregnated" wood, a heavy duty material for industrial insulation work, and a range of glass laminates based on epoxide, silicone, melamine and phenolic resins, which have excellent electrical properties, heat resistance and mechanical strength.

**H. J. Baldwin & Co., Ltd.,** 132, Arkwright Street, Nottingham.—**Stand J.21.**—Clay cable protection covers for l.v. and h.v. underground mains in a large range of sizes. Reinforced concrete specialities for the electrical industry include cable covers, stay blocks, marker posts, etc., concrete troughs and posts for railway electrification. "Wireohms" heating elements, for domestic and industrial use, and "Thermat" electric blankets and pads are also displayed.

**Baldwin & Francis, Ltd.,** Eyre Street, Sheffield, 1, Yorks.—**Stand S.7.**—Flameproof switchgear shown includes a three-panel switchboard consisting of a gate end box, a double circuit drill panel and a lighting transformer panel, and a 200 A air-break circuit-breaker. Among other items of flameproof equipment there are a 3·3 kV contactor panel; a h.v. lighting transformer panel; a 300 A restrained plug; and a 100 W lighting fitting.

**Bayliss, Jones & Bayliss, Ltd.,** Victoria Works, Wolverhampton.—**Stand Y.4.**—Transmission line equipment for h.v. and l.v. systems and telecommunications; and steel fencing and gates for power stations and substations.

**Beckett & Parker, Ltd.,** 157–159, Summer Lane, Birmingham, 19.—**Stand B.2.**—Included in a large range of switchboard type voltmeters and ammeters are moving iron, moving coil and rectifier moving coil types. The range of flameproof instruments has been further extended by the provision of an alternative base for the 4in meter and there is also a selection of shunts and bushing type transformers. New flush mounting square fronted meters are also displayed.

**Belmos Co., Ltd.,** Bellshill, Lanarkshire.—**Stand N.12.**—Air-break switchgear and control gear; group motor control gear; automatic contactor control gear; flameproof switchgear; and flameproof lighting fittings and accessories.

**The Benjamin Electric, Ltd.,** Brantwood Road, Tottenham, London, N.17.—**Stand L.14.**—To celebrate the company's golden jubilee a gold coloured stand displays a complete range of lighting fittings for industrial, commercial and outdoor use, the majority being finished in "Crysteel" vitreous enamel. The "Flurolier" fluorescent fittings include unit and continuous row mounting, and readily interchangeable variations such as closed-top, upward light, and angle reflectors, and a heavy duty fitting for use in dusty, humid and corrosive atmospheres.

Tungsten fittings exhibited meet practically every requirement, while outdoor fittings consist of floodlights, in particular the "Teelon" illuminated canopy.

Among new products are a "Mushroom" fitting consisting of an aluminium mushroom top cover attached to a main reflector supported on three tubular arms for 12ft mounting; "Bencolite" "AA" fittings of the opal globe type with an open bottom, for offices, schools, shops, etc.; a "Bentric" contemporary fitting consisting of a steel reflector with perforated rim for commercial use; and plastic cross baffles for 80 W single lamp "Flurolier" fittings.

**Berry's Electric, Ltd.,** Newman Street, London, W.1.—**Stand V.8.**—Three new "Magicoal" fires make their first appearance, in addition to an illuminated radiator. Many new lighting fittings are shown and of particular interest in the contemporary section are the "Pin-up" wall brackets which can be hung like pictures. Immersion heaters and the A.Q./3 and A.Q./1½ water heaters are also displayed.

**Bertram Thomas (Engineers), Ltd.,** Worsley Street, Hulme, Manchester, 15.—**Stand O.2.**—Switchgear for the protection of a.c. and d.c. plant for power stations, rolling mills, shipyards, electrolytic installations and traction services.

**Best Products, Ltd.,** Felix Works, Felixstowe, Suffolk.—**Stand L.18.**—Colour is the dominating feature of this display which includes the "Family," "Fanfare" and "Herald" electric kettles; the "Jiffy" 2-pint fast-boiling kettle; and the "Best" de-luxe electric blanket and the "Best" electric mattress overlay. The No. 4 coffee percolator, shown for the first time, is fully automatic and produced on the same lines as No. 2, but with improvements in the mechanism. Also new is the "Standard" electric kettle. A representative selection of "Best-Rempstil" elements from 750 to 2,000 W; and the "Vacuo" junction, a device for measuring small electric currents of audible and radio frequencies.

**Bill Switchgear, Ltd.,** Aston Lane, Perry Barr, Birmingham, 20.—**Stand M.8.**—A comprehensive range of l.v. distribution switchgear and accessories includes examples of "Royal," "Imperial," "Invicta," "Super K" and "Radette" metalclad switchgear. For domestic installations there is a selection of water heater switches; recently introduced cooker control switches with neon pilot indicators; "Civic" consumers' control units; and a range of "Crown" a.c. all-insulated and metalclad switches and switch-splitters from 15 to 60 A capacity. Also on view are "Majestic" flush type cubicle switchboards and a matching range of distribution boards as well as the "Minibar" busbar chamber with instantly fitted, sliding cable clamps for small installations up to 100 A capacity. Extensions in the range of "Consul" change-over switches are shown for the first time.

**F. C. Blackwell & Co., Ltd.,** Blaco Works, Crosby, Liverpool, 23.—**Stand L.3.**—Conduit fittings in pressed steel, aluminium, copper and zinc alloy.

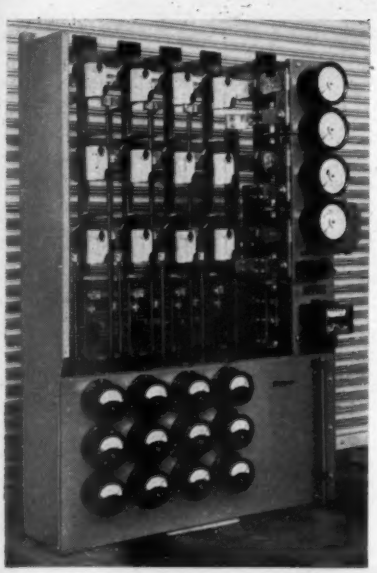
**Thomas Bolton & Sons, Ltd.,** Mersey Copper Works, Widnes, Lancs.—**Stand H.18.**—Copper and copper-base alloys in the form of wire and strand, bar and rod, sheet, strip and foil, commutator and other sections, tubes and machined parts; commutator bars and segments; "Combarloy" silver-bearing copper; tubular and laminated busbars; hollow copper conductors for rotor and stator windings; trolley and contact wire; rotor and stator end rings; cellular conductors for e.h.v. busbars and connections; and phosphor-bronze wire, strip and rod.

**Bonar, Long & Co., Ltd.,** East Kingsway Works, Dundee.—**Stand S.15.**—An example of indoor substation distribution equipment which includes frames made with transformer switch units from 800 to 2,000 A and distribution units up to 800 A is shown. Metering is supplied to suit customers' requirements and tailless or tail type gear can be supplied. There is also an outdoor distribution pillar, a range of rural transformers in standard ratings and up to 33 kV; and p.f. correction capacitors fitted with manual or automatic control gear, circuit-breakers and switch fuses. A 60 kVAr capacitor with contactor gear and a 50 kVAr capacitor of the mining type are among further exhibits.

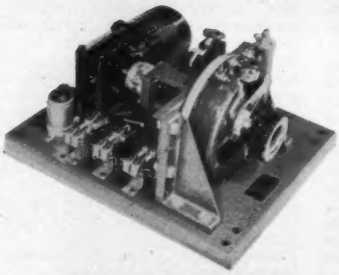
**F. H. Bourner & Co. (Engineers), Ltd.,** Manor Royal, Crawley, Sussex.—**Stand O.7.**—The company is showing the new "Supadynamic" Mark IV breech loading cartridge operated driving tool which will make fixings into brickwork, concrete, steel, etc. The new "Supadrive Minor," for fixing cable clips, earthing strip and a wide field of other small light fixings into brickwork, etc., is also demonstrated.

**S. O. Bowker, Ltd.,** 19, Warstone Lane, Birmingham, 18.—**Stand M.12.**—Switches, socket outlets, bell pushes, joint boxes, wiring clips and saddles, earthing clamps, porcelain and moulded connectors, protective steel channelling, wood casing, conduit saddles, crampets and bushes.

**Bowthorpe Electric Co., Ltd.,** Tinsley Lane, Crawley, Sussex.—**Stand U.7.**—Overhead fittings for copper and aluminium lines include line taps in aluminium and brass, insulating shrouds, transformer connectors, line connectors, operating rods, and wire rope clips, mid-span tension joints in aluminium and copper, line clamps, terminating thimbles, running-out blocks, insulators and dead-end clamps. The company's newly-developed system for attaching wire tails to ratchets is shown, also a wide selection of linesmen's tools and accessories. The Bowthorpe system of wood pole preserva-



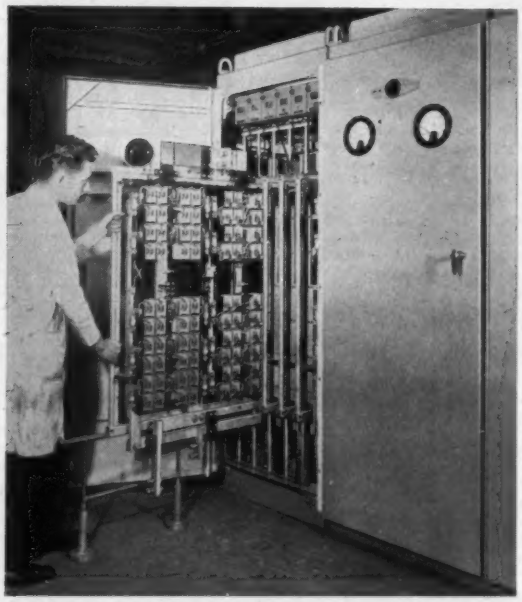
Bonar, Long indoor substation distribution equipment



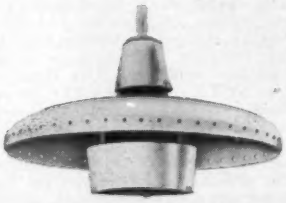
"Berco" motorised power rheostat (British Electric Resistance Co.)

Best Products model No. 4 coffee percolator

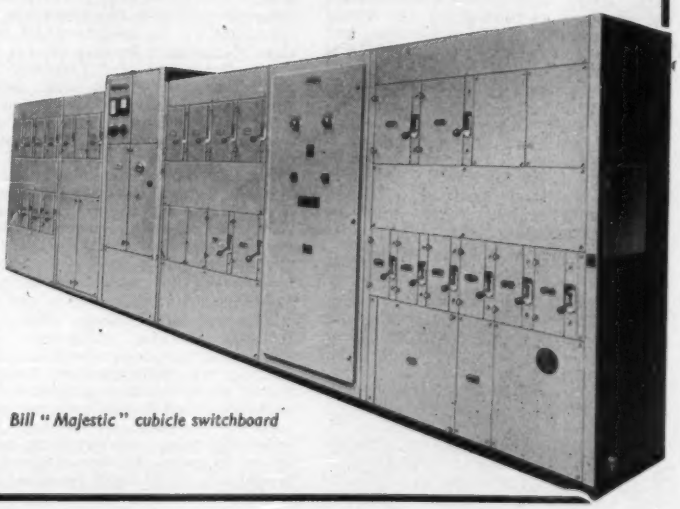
A flush mounting square fronted meter from the Beckett & Parker range



A typical B.T.H. germanium power rectifier cubicle showing one of the trays withdrawn



Benjamin Electric "Bentric" contemporary lighting fitting for commercial use



Bill "Majestic" cubicle switchboard

Redesigned Brook B.S. 66 light industrial motor

tion, using "Tutzal" paste and bandages, is displayed. New products are "Strip-clamps" for use with tubular busbars.

**Geo. Bray & Co., Ltd.,** Leicester Place, Blackman Lane, Leeds, 2.—**Stand J.1.**—A representative selection of products manufactured by both Electrical and Ceramic Departments are shown. These include heating elements, all of the refractory embedded metal sheathed type, available in strip, ring, pad, cartridge and sheathed wire form, and samples of complete air heater batteries and immersion heaters. Small electro-ceramic insulators in the form of tubes, beads, bushes and washers are also shown.

**British Central Electrical Co., Ltd.,** Briticent House, 6 & 8, Rosebery Avenue, London, E.C.1.—**Stand J.17.**—Among new products are a "Lumandar" lighting control unit operating on a photo-electric/galvanometric principle embodying a contactor capable of breaking 10 A; flameproof barrel pump with larger powered motor, suitable for pumping acids, solvents, foods, etc.; "Briticent" infra-red heaters; industrial and domestic infra-red heaters; and flush and surface three-phase m.c.b. units with and without trip buttons.

**British Electric Resistance Co., Ltd.,** Queensway, Enfield, Middlesex.—**Stand H.22.**—Vitreous enamelled resistors, fixed resistors on mica cards, porcelain and vitreous enamelled steel tubes, tubular and rotary rheostats for industrial and scientific apparatus and recent additions to the range of rotary "Regavolt" variable transformers are displayed. Automatic voltage regulators and stabilisers employing the variable auto-transformer principle, and a wide range of variable ratio auto-transformers are shown by the associated company, the British Power Transformer Co., Ltd. New products include a 1 W hermetically sealed, wire wound potentiometer, a miniaturisation of the model "R5." Grid resistors for rotor starters and speed regulators and a line voltage regulator with an exceptionally high output for its size and weight are also shown.

**British Electrical Repairs, Ltd.,** 10, Charlotte Street, Manchester, 1.—**Stand G.6.**—A wide variety of items associated with electrical plant repairs are represented by a selection of d.c. armatures and field coils of various sizes; representative high voltage stator coils of medium and very large sizes; a complete Ward-Leonard set consisting of three-phase a.c. driving motor with 6/10 kW generator and associated speed control motor; cylindrical and beam type electromagnets; and dynamic balancing equipment.

**British Foreign & Colonial Automatic Light Controlling Co., Ltd.,** 100, Holdenhurst Road, Bournemouth.—**Stand R.15.**—On this stand is a complete range of synchronous motor driven time switches, with or without spring reserve, incorporating a sealed micro switch for such applications as street lighting, shop window lighting, neon signs, immersion heating, poultry houses, etc. Process timers are also shown.

Dowsing Co. (Electrical Manufacturers), Ltd., an associated company, are exhibiting a range of cordless irons, flex irons, three-heat wall control irons and billiard table irons. Two types of electric sealing wax heaters, and laundry roller equipment are shown.

**British Insulated Callender's Cables, Ltd.,** Norfolk House, Norfolk Street, London, W.C.2.—**Stand G.9.**—A comprehensive selection of this company's wide range of products includes low, medium and h.v. cables; cable accessories; rubber and plastic insulated cables; cabled copper tube for instrumentation and control purposes; atomic grab cables insulated with p.t.f.e. for reactor charging machinery; telecommunication cables and accessories including polypole couplers; mineral insulated cables and accessories; mining and colliery cables and accessories including moulded rubber potheads, mining boxes and bolted flameproof couplers. There are also current collection equipment; power capacitors; winding wires and strips; coil-end flexibles; and copper and aluminium in busbars, strands and sections.

**British Switchgear Corporation, Ltd.,** Morden Factory Estate, Lombard Road, London, S.W.19.—**Stand U.11.**—Switch and fusegear, knife switches, panels, terminal blocks and low voltage isolating switches are shown as well as a solderless busbar and cable connectors.

**British Thomson-Houston Co., Ltd.,** Rugby.—**Stand J.12.**—On the part of the stand devoted to electric drive visitors will see the type KNC motor with Class "E" insulation, built to draft B.S. dimensions for ventilated motors; a "Stayrite" single-phase power drive comprising an extremely robust motor with push-button contactor-type starter; sectional models of various types of industrial motors, and several new models of f.h.p. motors. An industrial control gear exhibit demonstrates how the type DOC 71 push-button starter can be built into a compact motor control panel incorporating ammeter, h.r.c. fuses, and isolator. New types of crane protective panels and a panel for the control of machine tool drives are also shown, as well as a new capacitor d.c. braking equipment.

In the switchgear section the moving (oil circuit-breaker) portion of a Class QF11 metalclad vertical-plugging switchgear equipment which can be supplied for a rating of 1,000 MVA at 13·2 kV, and a three-phase automatic circuit recloser for the protection of rural transmission lines up to 11 kV are shown. A section on electronics features the "Emotrol" (electronic motor control); infra-red pyrometer electronic timers; and examples of photo-electric equipment.

**British Vacuum Cleaner & Engineering Co., Ltd.,** Goblin Works, Leatherhead, Surrey.—**Stand W.3.**—Four different types of vacuum cleaners, three cylindrical and an upright model, are on view. "Goblin" washing machines and a complete range of "Teasmade" tea-making sets are among other domestic appliances. A new range of industrial floor scrubbing, polishing and drying machines is being shown, as well as industrial cleaners.

Electrical timing apparatus is exhibited by the Magneta Time Co., a subsidiary of the company; the equipment shown can be supplied either to operate from a master clock or can be individually operated from controlled a.c. mains. Magneta sound equipment includes a wide range of loudspeakers.

**Britmac Electrical Co., Ltd.,** Britannia Works, Wharfdale Road, Tyseley, Birmingham, 11.—**Stand D.9.**—A wide range of accessories includes 5, 15 and 30 A switches; plugs and sockets including hinged flap patterns; switch sockets; lampholders; switch plates; indicating units; and watertight switches up to six-gang. Recent additions cover special a.c. short break switches, ceiling switches and switch sockets.

**Brook Motors, Ltd.,** Empress Works, Huddersfield.—**Stand N.13.**—The new "C" type ventilated motors to B.S. CW(ELE) 6246 (¼ to 50 h.p.) are exhibited for the first time. These motors offer the advantages of lower weight, smaller size and lower cost, and embody the results of research development in insulation materials, design techniques and production methods effected during the last ten years. Fan cooled motors range from ¾ to 50 h.p., and a selected range of light control gear includes a small contactor for f.h.p. use. In the fractional field, ranges of "Gryphon" motors include the 4in magnetic brake, grinding, buffing and polishing motors. The "Merlin" range is extended to include ball bearing types, in addition to sleeve bearings, flange and resilient mountings, a totally enclosed frame and a special oil burner flange. A new version of a light industrial motor (B.S. 66) covering the ¼ to 2 h.p. field is available for single- or three-phase supply in normal foot mounting or flange mounting types.

**Brookhirst Switchgear, Ltd.,** Northgate Works, Chester.—**Stand K.1.**—A further addition to the range of "Chester" switchboards, the "Chester Junior," consists of steel channel frameworks with pressed steel front, back and side covers; a.c. straight-on starters up to 25 h.p.; and distribution gear up to 400 A. Starters, switches and switchfuses are housed in individual enclosures fabricated from heavy gauge steel, and with hinged or bolted-on covers. The equipment has been tested for a through fault capacity of 35 MVA 440 V with 400 A h.r.c. fuses in the supply to the busbars and with the maximum size of h.r.c. fuses for the rating of each unit.

Other exhibits include two new a.c. "Arcmaster" contactors, suitable for use in continuous processes or where they are unopened for more than 8 hours. They have a minimum mechanical life of 5 million operations and are suitable for making and breaking 8 times their standard 25 and 50 A ratings.

**Browning's Electric Co., Ltd.,** Boleyn Castle, Green Street, Upton Park, London, E.13.—**Stand K.13.**—In addition to prototype motors, commutators and sliprings, magnetic equipment, soldering irons, etc., this company introduces a range of induction regulators. The range covers from 60 VA up to 27·5 kVA for single-phase, two-phase or three-phase systems. Infinitely fine stepless regulation can be obtained from zero to maximum volts and the overall efficiency exceeds 90 per cent at full load for a unity p.f. load, or 88 per cent for a 0·80 p.f. load. Regulators of 5 kVA and above consist of a single oil-immersed stator and rotor in a totally enclosed sheet steel tank. The rotor runs in tapered roller bearings, and the connections are made by flexible cables. A screw and link motion gives smooth operation.

**Brush Electrical Engineering Co., Ltd.,** Loughborough, Leics.—**Stand D.6.**—Steam and gas expansion turbines, turbo-alternator sets, power and distribution transformers, on-load tap-changing gear, a.c. and d.c. motors and generators, h.v. and l.v. switchgear, distribution gear, fusegear and h.b.c. fuses are among the products of this company. Motor exhibits range from a 1,350 h.p. 2-pole totally enclosed, squirrel cage, induction motor to a 5 h.p. hollow shaft pump motor. Generating equipment includes a 300 kVA alternator, a range of small self-regulating alternators, and a 3 kVA motor-generator

set with static transistorised automatic voltage regulator—demonstrating voltage regulation at varying loads and power factors.

**Bryce Electric Construction Co., Ltd.,** Kelvin Works, Hackbridge, Wallington, Surrey.—**Stand N.10.**—From the transformer range which extends to 20 MVA at 132 kV the largest exhibit is a 2,500 kVA 400/6·6 kV 3-phase, 50 c/s, transformer removed from its tank to enable close inspection of the constructional details to be made. Another exhibit is a magnetically shielded current limiting reactor, having a throughput rating of 1,430 kVA at 3·3 kV.

Power factor correction capacitors are represented by small units for the individual correction of motors, etc., to larger tank type units provided with contactor panels for fully automatic schemes. There is also a demonstration showing the working of an automatic p.f. correction scheme and for the measurement of p.f. the latest version of the Bryce power factor tester, which is used in conjunction with a clip-on ammeter, can be seen.

**Bullers, Ltd.,** Milton, Stoke-on-Trent.—**Stand W.5.**—Porcelain insulators and fittings for h.v. transmission lines and l.v. distribution; porcelain bushings; busbar supports; and ceramics for all electrical accessories and appliances.

**Bulpitt & Sons, Ltd.,** Swansea Works, Birmingham, 1.—**Stand L.24.**—The "Swan Brand" range of electric kettles and domestic electrical appliances, coffee percolators, urns, blankets, immersion heaters, glue pots, and ground base aluminium hollow-ware for electric cookers is prominently displayed.

On the same stand the associated company, B.K.B. Electric Motors, Ltd., is showing examples of its "Birmingham" range (manufactured by Bulpitt & Sons), including ½ to 3 h.p. single-phase, ¼ to 7½ h.p. three-phase, and ½ to 25 h.p. d.c. motors; a.c. and d.c. generators up to 30 kW; motor-generator sets; rotary convertors; frequency changers; and welding generators. The "Luton" range of motors (manufactured by Geo. Kent, Ltd.) includes a.c. and d.c. motors up to ½ h.p. and universal motors up to ¼ h.p.; d.c. motors with shunt, series or compound windings; a.c. motors with single- or three-phase windings; motor reduction gear units; small rotary transformers, etc. New products include a miniature a.c. geared motor for 50 c/s.

**Burco, Ltd.,** Burnley, Lancs.—**Stand S.2.**—The display includes 5 and 10 gal wash boilers; washing machines; and the new "Tumblair" clothes drying machine.

**Burgess Products Co., Ltd.,** Dukes Way, Team Valley, Gateshead, 11.—**Stand N.16.**—The Micro Switch Division is displaying the new V3 miniature switch. Externally it is similar to the V3 "Switchette," but the new model has a completely new interior mechanism which provides improved operating characteristics and a minimum mechanical life of 10 million operations. Besides the standard model, there is also the V3/2 switch with reduced operating force and the V3/4 with reduced movement differential. Double-pole switches, consisting of two new V3 switches operated together by plunger actuators of various lengths, are also shown.

**W. Canning & Co., Ltd.,** 133–137, Great Hampton Street, Birmingham, 18.—**Stand U.1.**—Polishing and plating equipment and materials for the finishing of metals as applied to the electrical trades.

*An induction regulator from Browning's Electric Co. range*

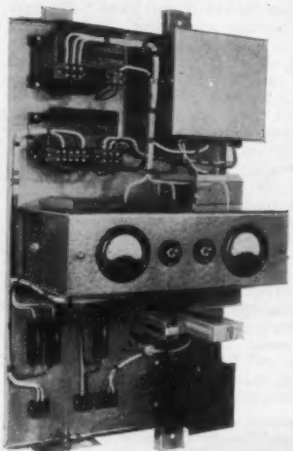
*Brookhirst "Chester Junior" switchboard*

*Bryce power factor tester for use with clip-on ammeter*

**Carter & Co. (Nelson), Ltd.,** William Street, Nelson, Lancs.—**Stand Q.11.**—Sirens and fire alarm apparatus; unit heaters with open wire or sheathed type elements in loadings from 3 to 10 kW; and control gear for both fire alarm and heating equipment.

**Cayson Electrics, Ltd.,** 139, Queens Road, Watford, Herts.—**Stand J.7.**—The principal exhibit is a working model of a "Caytel" constant voltage d.c. power supply unit. These equipments maintain a constant d.c. output voltage within close limits for wide variations in mains supply voltage and load current. There is also a selection of normal rectifier equipments and battery chargers, transformers and control gear for fluorescent, mercury vapour and sodium discharge lamps.

*"Caytel" constant voltage d.c. power supply unit (Cayson Electrics, Ltd.)*



**Central Electricity Generating Board,** Winsley Street, London, W.1.—**Stand C.2.**—The Board's display indicates the progress made by the electricity supply industry and refers to the new power station construction programme—particularly nuclear. Tickets for group visits to Battersea and Fulham power stations are obtainable from the stand's inquiry bureau.

**Chilton Electric Products, Ltd.,** Hungerford, Berks.—**Stand L.15.**—A new range of monitoring units designed to

protect the users of portable electric tools is demonstrated. "Atlas Minor" circuit-breakers are exhibited in various pole sizes, in new sheet steel enclosures. Flush-mounted units are also being shown, as well as solenoid actuated remotely controlled units. Special forms of the "Atlas Minor" illustrate the wide versatility of this type of circuit-breaker. Other switchgear exhibits include standard units of Chilton earth leakage circuit-breakers both voltage and current operated. In addition, the company is showing its new British-made portable electric spin dryer; the "Sportsman" dry shaver; "Acculux" pocket lamp; and universal shaver sockets.

**Chloride Batteries, Ltd.,** Clifton Junction, Swinton, Manchester.—**Stand K.24.**—"Keepalite" emergency lighting equipment for operating theatres, corridor and ward lighting and all stand-by duties is displayed in addition to "Exide-Ironclad" traction batteries and "Drydex" dry batteries.

**City and Guilds of London Institute,** Gresham College, Basinghall Street, London, E.C.2.—**Stand P.14.**—Information is available regarding courses on electrical engineering and related examinations offered by the Institute.

**Clang, Ltd.,** Cricklewood, London, N.W.2. — **Stand D.1.** — Representative range of domestic and industrial electrical accessories including weatherproof plugs and sockets.

**Clare Instrument Co.,** 8, South Street, West Worthing, Sussex.—**Stand E.1.**—Among new products is a transformer test set incorporating iron loss measurement and a.c. potentiometer for precise determination of output voltage and regulation. Other products are a limit bridge with amplifier having a range of measurement down to 0·1 ohm; a low range ohmmeter for testing switch contacts (20 deg deflection for 0·001 ohm); and a simple earth continuity tester at 25 A.

**H. Clarke & Co. (Manchester), Ltd.,** Atlas Works, Patricroft, Manchester.—**Stands N.8 & S.8.**—Electrical insulating materials include laminated Bakelite and micanite in sheet, tube and rod form; pure mica stampings, elements, etc.; fibreglass and silicones; fabricated bobbins, plastic cable trunking, bushings; and stampings, formers and bobbins manufactured from "Presspahn" materials.

**E. K. Cole, Ltd.,** Ekco Works, Southend-on-Sea, Essex.—**Stand F.11.**—The main feature of the Ekco "Thermovent" heating equipment display is the new type "K" 2 kW convector heater. Models are available with automatic heat control or with a two-heat switch. Safety in use is ensured by guards over both the air inlet and outlet. "FR" portable convectors with coloured front panels are shown as well as inset convectors, with or without thermostatic control, for building into walls, partitions, furniture, etc. Both are available in 1 and 2 kW loadings. For domestic or commercial use the "SR" range of floor standing metal cased convectors are in 1½, 2 or 3 kW sizes. Other exhibits include the type MRL, a general purpose wall-mounting convector; the radiant glass "Thermopanel" heater; high temperature panel heaters; standard, horticultural and flameproof "Thermotubes"; a drying cabinet heater; and a selection of thermostatic controls.

**Contactum, Ltd.,** Victoria Works, Edgware Road, Cricklewood, London, N.W.2.—**Stand K.22.**—A new range of plaster-depth flush a.c. switches is shown. These switches are mounted not only singly but as two-gang and three-gang on the same one-gang size square plate. Also new is a group of 2, 5 and 15 A three-pin surface a.c. shuttered switched socket-outlets, complete with plugs. The 5 and 15 A sizes are made in double as well as single-pole. A 13 A two-way shuttered socket adaptor has been added to the company's range of shockproof accessories which includes plugs and sockets, switched socket-outlets, bell pushes, spur boxes, junction boxes, flanges, connectors, boxes, etc.

**Controlled Heating Units (London), Ltd.,** Avenue Road, Hampton, Middlesex. —**Stand R.7.**—Metal sheathed, mineral embedded elements for domestic and industrial purposes include a range of immersion heaters as well as elements for kettles, washing machines, oil-filled radiators, etc. Thermostats are also exhibited.

**Copper Development Association,** 55, South Audley Street, London, W.1.—**Stand T.5.**—Exhibits include components manufactured from cadmium copper, chromium copper, silver copper and tellurium copper, the subject of a relevant C.D.A. publication, "High Conductivity Copper Alloys." Among other items are cables, radio valves and printed circuits. To exemplify the extensive use of copper there is a scale model of a 23,500 kVA turbine generator.

**Courtney, Pope (Electrical), Ltd.,** Amhurst Park Works, Tottenham, London, N.15.—**Stand L.13.**—A number of lighting fittings installed in a suspended grid ceiling and an illuminated display screen are shown. Window display lighting is included and attention is drawn to the new "Mobilyter" window display aid consisting of a spring loaded tube which can be placed in shop windows from 7ft 10in to 8ft 9in in depth. It has three ball and socket joints to which any tungsten fittings can be fixed.

**J. A. Crabtree & Co., Ltd.,** Lincoln Works, Walsall, Staffs.—**Stand L.17.**—The display of wiring accessories includes "Lincoln" and "Standard" switches, ceiling roses and lampholders, as well as an entirely new type of multi-gang switch assembly. Among recent additions is a 15 A flush mounting a.c. switch made to the same dimensions as the 5 A "Standard" pattern and an a.c. surface mounting switch having the same terminal and fixing centres as the No. 3000 "Lincoln" switch.

As an extension of the "matched" range of wiring accessories, there is a display of 13 A and 5 A switched socket-outlets fitted with neon indicator lights. A new 2 A surface mounting a.c. switched socket-outlet and plaster-depth accessories are also shown. Another new development is the type F–60 miniature circuit-breaker, capable of breaking a fault current of 4,000 A at 250 V a.c. Motor control gear exhibits include type D–6 (hand operated), type A–15 (oil break) and type B–15 (air break) starters ar well as flamepro of remote control stations and variously operated limit switches.

**Creators, Ltd.,** Sheerwater, Woking, Surrey.—**Stand S.12.**—In addition to the standard sleeve type of cable marker there are a number of moulded neoprene and polystyrene markers, and a self-adhesive tape marker in fibreglass and aluminium, suitable for temperatures up to 600 deg F. Many new designs of terminal blocks are on view as well as a range of extending cables and hand and bench sleeve expanders for use with identification and binding sleeves.

**Critchley Bros., Ltd.,** Brimscombe, Stroud, Glos.—**Stand U.10.**—The company is showing a new type of moulded cable marker which can be clipped over the cable insulation at a point near the terminal during the course of wiring-up equipment. Like the interlocking ferrule, it carries either a figure or letter and any code can be built up. Six sizes are made for cable from 0·130 to 0·330in diameter. Known as the C-type marker, it is moulded in p.v.c. and is non-inflammable and non-hygroscopic.

**Crompton Parkinson, Ltd.,** Crompton House, Aldwych, London, W.C.2.—**Stand H.11.**—The main display is of the new "Modulume" luminous ceiling, an electrical entity based on the "New Line" galvanised trunking which accommodates all the electrical wiring and from which is suspended the luminous ceiling structure. Two principal forms of ceiling, developed on a 36in module, are demonstrated. A selection of "New-Range" lighting fittings and "New Line" lighting trunking are also shown.

The "Series 5" motors manufactured to the dimensions established in the standard for ventilated types (B.S. 2960: 1958) are representative of a manufacturing range (1 to 50 h.p.) of squirrel-cage induction types, with drip-proof enclosure suitable for foot, flange (horizontal or vertical) and vertical pump (skirt mounting) mountings. The selection of "T" series f.h.p. motors includes a demonstration of a constant reversal test applied by the Development and Research Department in evaluating heating, vibration and overload characteristics in a new design. Other f.h.p. motors include an explosion proof, a geared totally-enclosed fan-cooled, and two d.c. types.

The switchgear exhibit consists of a floor-mounted sheet steel cubicle incorporating two A.B.M. air circuit-breakers and flush type switch-fuse units. The circuit-breakers are typical units of a range covering 600 V, 3,000 A requirements, up to 30 MVA rating. Portable earthing equipment which can be arranged for either rating of circuit-breaker is also shown.

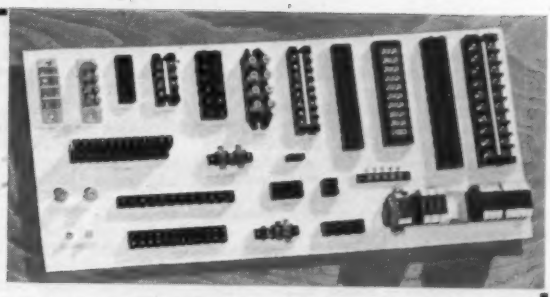
**R. & A. G. Crossland, Ltd.,** Cartbridge Lane, Walsall, Staffs.—**Stand K.25.**—Lighting fittings and reflectors for all types of lamps, including examples of fluorescent reflectors combined with a power trunking system and recessed pattern fittings for module ceilings; and a range of electric fires and convectors available in a wide range of coloured finishes.

**Dale Electric (Yorkshire), Ltd.,** Electricity Buildings, Filey, Yorks.—**Stand T.25.**—As manufacturers of lighting plants, battery charging sets and automatic generating plant this company exhibits a 7 kW air cooled generator from its "Rhino" range in addition to small petrol units. The "Dale" earth prove unit, a device designed to give maximum protection against electric shock to operators of portable tools, etc., and the "Roll-a-Drum" equipment for supporting cable drums, are other exhibits.

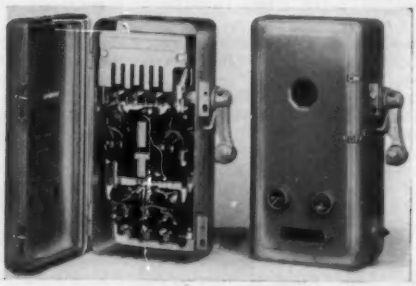
**Davis Sheet Metal Engineering Co., Ltd.,** Eley's Estate, Angel Road, Edmonton, London, N.18.—**Stand L.10.**—Standard "Quick-Fix" cable trunking; power feeds by busbar and tap trunking, with suggested overhead supplies; busbar chambers and busbar risers; various examples of skirting, flush floor and under floor trunking; and the "Quick" punch.

Courtney, Pope "Mobilyter" window display aid

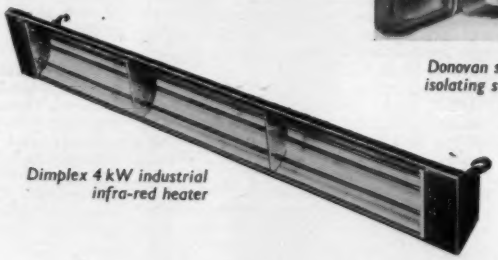
Ekco "Thermovent" type K convector heater (E. K. Cole, Ltd.)



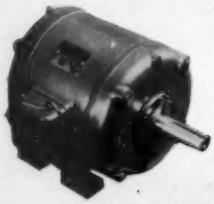
Part of Creators range of terminal blocks



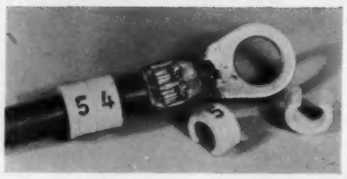
Donovan small direct-on-line starter with isolating switch up to 3 h.p., 415 V, 50 c/s



Dimplex 4 kW industrial infra-red heater



Crompton Parkinson "Series 5" ventilated motor




Critchley C-type cable marker

Typical series "R" hermetically sealed miniature relay ("Diamond H" Switches, Ltd.)

Dennis medium voltage cubicle switchboard

Dale Electric 7 kW air cooled generator from the "Rhino" range

**Delta Technical Services, Ltd.,** Cowleaze Road, Kingston-on-Thames, Surrey. —**Stand E.2.**—A Buxton-certified flameproof pressure switch for gases in Groups I, II and III is available for operation on vacuum or in a range of pressures from a few inches w.g. up to 10 tons/sq in. In addition to vacuum switches there are pressure switches, thermostats, differential pressure switches and velocity-of-flow operated instruments. Most models are available fabricated in special materials such as stainless steel for use on atomic energy or similar projects.

**G. P. Dennis, Ltd.,** Fleming Road, Speke, Liverpool.—**Stand G.4.**—Besides a range of "Hi-Style" distribution fuse boards and on-load isolators, the company's latest design of cubicle switch board is shown. A general display of examples of heavy duty metalclad switch boards, substation frames and feeder pillars completes the display. Trunduct, Ltd., an associated company, is showing its new busbar supply systems and rising mains, a special feature of which is the elimination of the normal tap-off box for branch circuit positions.

**Dexion, Ltd.,** Maygrove Road, London, N.W.6.—**Staircase Stand.**—More than 10,000ft of "Dexion" slotted angle and 4,000ft of punched steel strap is incorporated in the two stair units which provide visitors to the exhibition with the main access between the ground floor and gallery. The company's stand is at the base of the structure.

**"Diamond H" Switches, Ltd.,** Gunnersbury Avenue, London, W.4.—**Stand K.2.**—Pride of place is given to the series "R" and "S" hermetically sealed miniature relays which the company is now manufacturing in this country. Hitherto, they have only been obtainable from the parent company in the U.S.A. By virtue of their very good shock and vibration characteristics, coupled with a temperature range of −65 to +200 deg C, these relays are suitable for such applications as guided missiles, aircraft, computers, etc. Other standard products include oven thermostats; energy regulators; heater switches; multi-circuit switches; toggle switches; and snap-in neon indicators, including a new miniature series.

**Dimplex, Ltd.,** Millbrook, Southampton.—**Stand J.6.**—Domestic, commercial and industrial infra-red heating equipment is displayed on this stand. Now in full production, the new industrial infra-red heaters are shown functioning at the recommended mounting height to give a 20ft high beamed spread from each unit. In loadings of 2½ to 4 kW, they incorporate indestructible Inconel elements and are suitable for use on single or three-phase supply. The new domestic model has a 750 W spiral element in a toughened silica sleeve and is for wall mounting only.

Included in the full range of "Dimplex" oil-filled thermostatically controlled electric radiators are new column type models with loadings of 1, 1½, 2 and 3 kW. The panel models are shown with loadings of ½ to 2 kW. For wall mounting panel type radiators pressed steel top plates can now be supplied to match the radiator. A fully Buxton-approved flameproof oil-filled electric radiator and a gastight radiator are also displayed.

Other exhibits include the "Major" and "Minor" oil-filled electric towel rails; a 450 W "Junior" oil-filled heater designed as an anti-frost heater for the loft or garage, or for heating very small rooms; and oil-filled electric airing cupboard heaters in 150 and 300 W sizes. Completing the electric heating display, there are skirting board styled convector heaters in two sizes (2ft 300 W and 3ft 500 W).

**Donovan Electrical Co., Ltd.,** 70–82, Granville Street, Birmingham, 1.—**Stand G.5.**—Examples of contactor starters and controllers, push buttons, limit switches and other control accessories, together with power relays and contactors, are shown, as well as the "Runtact" duct system and "Donlok," "Safuse" and "Scrutact" heavy duty ironclad switch and fuse gear, change-over switches, industrial switch sockets and plugs, and trolley wire safety switches for cranes. Of particular interest is a small direct-on-line starter with incorporated isolating switch up to 3 h.p. on 415 V, 50 c/s.

**Dorman Smith Group of Companies,** Ordsal Electrical Works, Manchester, 5.—**Stand G.10.**—Dorman & Smith, Ltd., display a typical switchboard and an example of a new type of cubicle switchboard built from standard components. Among new products are a range of 400/750 A type T.S. switch and switch fuses and "Loadmaster" miniature circuit-breaker consumers' units up to 12-way.

British Klockner Switchgear, Ltd., show examples of standard automatic motor starters, including limit switches, also ancillary gear; contactors for general and heating control duty; and cubicle type multi-motor control panels.

D.S. Plugs, Ltd., exhibit plug and socket outlets to B.S. 1363; round pin "DS" type fused plugs and socket outlets; cooker control units; a new cooker control unit fitted with an earth leakage push-button circuit-breaker; the "King-Pin" fuse tester hand torch; and industrial fused plugs and socket outlets for three-phase circuits. New developments include a new plug which will fit the B.S. 546 gauge, but with a fused pin, or alternatively two fused pins; the fuse rating can be either 15 or 5 A.

Alorite, Ltd., show examples of ceramics including tri-post terminals; "mini-leads"; insulators; and h.r.c. cartridge fuse link bodies.

**D.P. Battery Co., Ltd.,** Bakewell, Derbyshire.—**Stand K.4.**—A display of large stationary type 800 Ah cells, in wood lead-lined boxes forms the main feature of interest. There is also a wide range of open and sealed-in cells for all stationary applications in generating stations and telephone exchanges, emergency lighting, switch tripping and closing, railway signalling, country house lighting, and radio communications.

**Dubilier Condenser Co. (1925), Ltd.,** Ducon Works, Victoria Road, North Acton, London, W.3.—**Stand M.13.**—Power factor correction capacitors, including automatic control equipment; "Duconol" capacitors for fluorescent lighting and other a.c. applications, also water-cooled types; "Drilitic" capacitors for a.c. capacitor start motors; automatic voltage and speed regulators; servo regulators; electro-magnetic mercury switch relays; and tubular slide-wire rheostats and resistances.

**Easipower, Ltd.,** 27, Albemarle Street, London, W.1.—**Stand R.2.**—Latest addition to the company's range of household electrical appliances is the "Perfectaire" fan heater, a light, versatile heater and cooler whose other uses include warming, hair drying, airing clothes, pantry cooling and air freshening. It has three temperature positions: cold; warm (1 kW); and hot (2 kW) and weighs approximately 8 lb. Another new product is the "Silver Arrow" thermostatically controlled iron with the element embedded in the sole plate. Also on view is the "Dreamland" electric blanket; an electric kettle; and the "Tip Toaster" electric toaster.

**E. F. Electric, Ltd.,** Willow Lane, Watford, Herts.—**Stand H.17.**—Domestic electric wiring accessories, including the "Ruby" range; and new metalclad industrial units.

**Ega Electric, Ltd.,** Holyhead Road, Wednesbury, Staffs.—**Stand Q.3.**—Since the types PIR/A and PIR/B plug-in relays were exhibited last year, many modifications have been made. The PIR/A is now available with a larger finger box accommodating up to four pairs of contacts and providing sufficient clearance for each pair of contacts to work on 440 A a.c. The deeper box provides for up to five pairs of fingers for work on lower voltages. The finger boxes and the magnetic system of type PRI/B are now housed in a die-casting which makes for much more rigid assembly. The unit can also be fitted with the larger size of finger box when required. The type PIR/C relay which has not previously been exhibited, is essentially a d.c. version of the PIR/A with a redesigned magnetic system. New multi-point plug-in connectors are also displayed as well as new additions to the range of "Egatube" non-metallic conduit and fittings.

**Ekco-Ensign Electric, Ltd.,** 45, Essex Street, Strand, London, W.C.2.—**Stand D.7.**—A representative range of lighting products includes tungsten filament, mercury and sodium discharge lamps; fluorescent lighting fittings; control gear and accessories; and trunking.

**Electric Construction Co., Ltd.,** Bushbury Engineering Works, Wolverhampton.—**Stand F.8.**—Medium and heavy electrical engineering equipment displayed includes a 550 b.h.p. 3·3 kV, three-phase, 330/325 r.p.m., vertical spindle, squirrel cage motor with drip-proof canopy; a germanium rectifier equipment (supply 400 V, 50 c/s, three-phase), output 30 V d.c., 2,500 A; 25 MVA 440 V Admiralty type distribution switchgear controlling a 25 kW alternator with an interconnector circuit-breaker and outgoing switch fuse circuits; and an electronic contactor control equipment for a triple Ward-Leonard set arranged for speed control of motors of an accuracy ±0·5 per cent to be operated in any differential relative to one another. The interior of a 1,000 kVA 11 kV T1 transformer will also be displayed out of its tank.

**Electric & Ordnance Accessories Co., Ltd.,** Hanley, Stoke-on-Trent.—**Stand K.12.**—Typical examples of die pressed porcelains as extensively used in the electrical accessories industry are shown, in particular the unglazed grey E.B.3 material. There are also h.v. porcelains for terminal insulators, etc., up to 33 kV.

**Electrical Apparatus Co., Ltd.,** New Barnes Avenue, Mile House Lane, St. Albans, Herts.—**Stand G.3.**—Among the industrial and flameproof types of a.c. and d.c. manually-operated and fully automatic motor control gear and accessories on display is a new range of direct-on starters and automatic panels. Cubicle type fully automatic switchboards are also shown. There is a section devoted to controllers, airbreak circuit-breakers and a.c. contactor type units for all types of starting. Accessories include float switch-

gear, rotary selector switches, local and remote push-button stations, etc. Other exhibits are hand operated airbreak and oil-immersed starters; a full range of instruments, including a new 3in frequency meter together with examples of miniature moving coil instruments in moulded Bakelite enclosures. There is also a demonstration of the E.A.C. dynamic braking system of hoist control.

**Electrical Industries Benevolent Association,** 10, Buckingham Palace Gardens, London, S.W.1.—**Stand P.11.**—This stand serves as an information bureau where particulars can be obtained of the progressive social organisation at the headquarters of the Association and its 56 branches. In 1956 no less than £54,322 was spent on 556 beneficiaries and their dependants, an increase of over £9,000 on the previous year.

**Electrical Remote Control Co., Ltd.,** Bush Fair, Tye Green, Harlow, Essex.—**Stand T.27.**—A range of electrical timing equipment for operation on a.c. and d.c. includes continuously cycling and single and multiple time interval models with and without automatic reset. There are also a.c. and d.c. multiple contact and mercury relays. New products include a redesigned automatic synchronous process timer, type AB, for operation on up to 440 V a.c.; a miniature low voltage soldering iron, type B.25; an automatic timer, type AHS; and a redesigned relay, type TMT.

**Electrical Research Association Laboratory,** Cleeve Road, Leatherhead, Surrey. — **Stand C.3.** — Items demonstrated include apparatus for investigating short-circuit forces in transformers; apparatus for the study of dielectric breakdown by surface discharges; equipment used in surge investigations in the field; and a recording anemometer and wind direction indicator developed in connection with the investigation of aeolian vibrations in overhead lines.

**Electrical Review Publications, Ltd.,** Dorset House, Stamford Street, London, S.E.1. — **Stand B.6.** — Up-to-date and authoritative books on various aspects of the electrical industry are displayed. Of special interest is "Modern Electrical Contracting," by H. R. Taunton, A.M.I.E.E., which describes the organisation of a contractor's business and the routine for operating it. The activities and background of leading personalities in the electrical industry are given in the "Electrical Who's Who," 1958–59 edition, containing about 8,000 entries (ready May, 1958).

During the course of the exhibition representatives are available to deal with inquiries relating to all matters connected with the electrical industry.

**Electro Automat, Ltd.,** 366, Moorside Road, Swinton, Manchester.—**Stand R.8.**—High stability selenium rectifiers, widely used in general electronic and industrial applications.

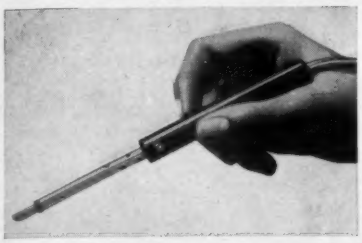
**Electro Dynamic Construction Co., Ltd.,** St. Mary Cray, Orpington, Kent.—**Stand L.19.**—Exhibits comprise a varied selection from the company's range of rotating electrical machines including marine type motors, alternators, and vertical pump motors, together with h.f. machines with magnetic amplifier or electronic voltage regulators for radar, echo sounding or similar applications. In the control gear section are examples of automatic relay and contactor panels, panels for control and protection of diesel engines, a stress testing machine and a marine type d.c. motor starter.

**Electro Mechanical Manufacturing Co., Ltd.,** 133–135, Grand Buildings, Trafalgar Square, London, W.C.2.—**Stand H.1.**—All-isolating flush fronted cubicle switchgear incorporating many new features for both motor and power control forms the central exhibit and this will be flanked by the latest design of unit construction switchgear which is suitable for both indoor and outdoor installation under all conditions of service.

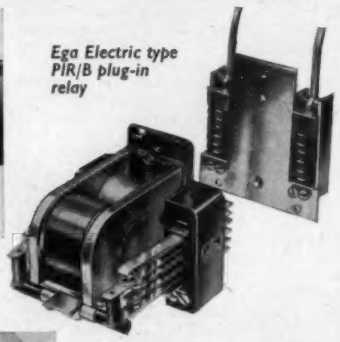
**Electro Methods, Ltd.,** Caxton Way, Stevenage, Herts.—**Stand R.16.**—Many new and interesting developments are included in a selection of miniature and sub-miniature plugs and sockets; connectors; relays; time delays; temperature controls; solenoids; tachogenerators; magnetic amplifiers; insulators; reactors; and integrating motors.

**Elliott Bros. (London), Ltd.,** Century Works, Lewisham, London, S.E.19.—**Stand M.5.**—Among the new instruments are the "Elliott-Petch" pressure detector, a safe, positive detector for indicating whether or not a h.v. conductor is alive; a reflecting dynamometer; a completely new range of rectangular switchboard and panel instruments; a portable dynamometer multi-range a.c. test set; and 2in miniature "Edgewise" instruments.

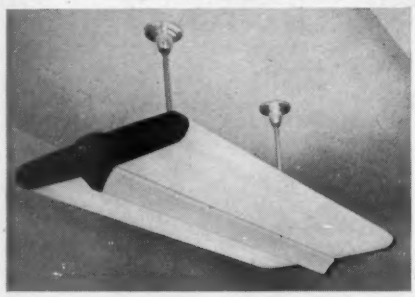
Other equipment includes long-scale switchboard instruments in 3½, 4, 6 and 8in sizes; miniature panel instruments, multi-channel recording instruments; examples from the "Bristol's" range including single- and multi-channel models of the "Dynamaster" electrical self-balancing potentiometer recorder, and the recently introduced disc-chart recorders for volts and amps. Miniature components for precision servomechan-



*Electrical Remote Control Co.'s type B.25 miniature low-voltage soldering iron*



*Ega Electric type PIR/B plug-in relay*



*Typical Ekco-Ensign commercial fluorescent fitting*

*Easipower "Perfectaire" fan heater*

*Delta Technical Services flameproof pressure switch*

*E.A.C. new type enclosure for multi-motor cubicle equipment*

isms, data-transmission systems and other applications are also shown in addition to typical industrial speed indicating and recording equipment with its component parts.

As an example of the application of instruments to complete process control systems, a display panel emphasises the importance of the two most critical variables, temperature and time, involved in industrial rubber and plastics processes. A simple application of the Elliott electrical weighing system is demonstrated.

**George Ellison, Ltd.,** Perry Barr, Birmingham, 22B.—**Stand M.7.**—Selections from the company's range of switchgear cover distribution switchgear, motor starters, crane control gear, tappet operated limit switches, cable end couplings and cable fittings. Shown for the first time is an 11 kV triple-pole switch (ASTA tested to B.S. 2631 : 1955) suitable for service with oil-filled circuit-breaker units. The normal current is 400 A, breaking current 400 A and making capacity 250 MVA. The switch is manually operated and the design embodies interlocking arrangements. Another introduction is the "Geof" 400 A circuit-breaker (ASTA tested to B.S. 936 : 1940) with a breaking capacity of 25 MVA at 400 V and 37·5 MVA at 660 V. It is suitable for mounting to wall or stanchion and has many features including individually reversible contacts; trip-free handle; cushioning of the contact mechanism; solenoid operated releases with oil dashpot time lags.

**E.M.B. Co., Ltd.,** Moor Street, West Bromwich, Staffs.—**Stand M.15.**—A control desk supplied to the order of Babcock & Wilcox, Ltd., for the operation of Babcock mechanical handling plant at the atomic energy station at Chapel Cross is the chief exhibit. There is also a contactor control panel for the hoisting motion of a 40 ton electric overhead travelling crane. This panel is for use with an 80 h.p. a.c. motor and incorporates a "Microsen" variable speed control unit.

**EMP Electric, Ltd.,** Garman Road, Tottenham, London, N.17.—**Stand T.24.**—The range of lightning arrestors not only shows constructional details of the divertor range, for all ratings up to 300 kV, but includes all standard distribution, line and station patterns. Among new types of surge counters shown is a recently developed 6-channel counter. In the h.v. fuse field, a new load break expulsion cut-out is exhibited together with cartridge fuse disconnects. The range of tested oil-tight tripping fuses to B.S. 2692 now not only includes an oil-tight tripping range up to and including 11 kV, 60 A for 250 MVA duty in a fabric barrel, but also in a ceramic barrel with special features. The company's range of m.v. h.r.c. fuses to B.S. 88/1952 has been extended to cover certain ratings in compliance with Canadian Standard 106.

**E.M.S. Electrical Products, Ltd.,** Common Lane, Kenilworth, Warwickshire. —**Stand F.12.**—The "Trolleyduct" single-phase feed rail and "Trolleymaster" three-phase and multipole enclosed collector track are displayed. Other items are the "Uniduct" three-phase enclosed collector tract; "Minibus" miniature busbar system; "Miniplug" plug-in duct; and "Plug-bus" plug and socket system.

**Enfield Cables, Ltd.,** Victoria House, Southampton Row, London, W.C.1.—**Stand H.13.**—Electric cables of all types in addition to joint boxes, and cable accessories are shown.

**Engel & Gibbs, Ltd.,** Warwick Road, Boreham Wood, Elstree, Herts.—**Stand K.23.**—A new method of completely encasing their mercury switches in a resilient translucent plastic material is introduced. Apart from resisting mechanical shock, they are also able to withstand thermal shock, a feature of particular interest to heating and refrigeration engineers. An alternative opaque coating can be supplied which is suitable for higher operating temperatures associated with hotplates, etc. High voltage vacuum switches are also displayed.

**English Electric Co., Ltd.,** Queen's House, Kingsway, London, W.C.2.—**Stands N.11 & Y.8.**—Exhibits and photographic displays cover motors, transformers, fusegear, switchgear, rectifiers, welding equipment, meters, relays, instruments, electronic equipment and electrical plant of various types. A new range of "Red Spot" heavy duty fuseboards is shown for the first time by the Fusegear Division. The busbars and incoming cable sockets are enclosed in solid insulation and insulating shrouds are provided over the fixed contact in the fuse bases. The fuse carrier is so shaped that however awkwardly it may be inserted into its fuse base it is impossible for the operator to touch "live" metal.

On Stand Y.8 the company exhibits its range of domestic appliances. Among these is the new 3·6 cu ft model 7503 refrigerator. Of particular interest to service personnel is an exhibit showing the assembly of the "Homemaker" electric cooker, while another exhibit deals with "Drying through the Ages" from the days of the earliest machines up to the present-day tumbler clothes dryer. The company's tumbler dryer has recently become available with a 4 kW heater and a single-phase or three-phase motor.

**Erma, Ltd.,** Mount Pleasant, Alperton, Wembley, Middlesex.—**Stand T.14.**—Solderless terminals and cable lugs; cable crimping tools (manual, hydraulic and pneumatic); standard and "Trig-O-Matic" wire strippers; and "Quickie" collet fixtures.

**Erskine, Heap & Co., Ltd.,** Lancashire Switchgear Works, Broughton, Manchester, 7.—**Stand O.4.**—Examples of switchgear and motor control gear include switchgear up to 11 kV, 250 MVA ASTA tested rupturing capacity: l.v. switchgear; motor control gear both o the hand operated and contactor pattern for direct starting, star-delta, auto-transformer and slip-ring starting; d.c. circuit-breakers; knife switches; fuses; isolating links; flameproof switchgear and motor control gear, moving iron ammeters and voltmeters. A basic principle of the company's l.v. ASTA tested circuit-breaker is the patented "direct blast" arc control device. A complete range of contactor type motor control gear is also exhibited.

**Everett Edgcumbe & Co., Ltd.,** Colindale Works, Colindeep Lane, Hendon, London, N.W.9.—**Stand N.12.**—The space-saving 6in square (4in chart) "Inkwell Minor" grapher is among the latest developments in graphic or recording instruments. Examples of the "Synclock" self-starting motor and its application in process timers, time interval meters, etc., are shown. Indicating instruments, including ammeters, voltmeters and watt-meters; and testing instruments including the "Metrohm" insulation and conductivity tester, phase sequence indicator, battery charge indicator and portable photometer are also on view.

**Evershed & Vignoles, Ltd.,** Acton Lane Works, Chiswick, London, W.4.—**Stand B.1.**—Specialised "Megger" instruments include insulation testers, insulation and continuity testers, circuit testing ohmmeters, bond testers, earth testers and bridge testers. Among the insulation testers is a new three-voltage, Series 2 model, which has recently been marketed. There are also "Ducter" low resistance testing sets; a workshop ohmmeter; portable and switchboard instruments; a "Dionic" water tester; and switchboard instruments. A representative selection of f.h.p. motors available for servo mechanisms or special purposes is also on view.

**Expanded Metal Co., Ltd.,** Burwood House, Caxton Street, London, S.W.1.—**Stand U.5.**—The "Expamet" heavy duty resistors for electric and diesel-electric locomotives and motor coaches, industrial motor starting, test loads and duct heaters are shown. The "Cressall" light duty range includes asbestos woven grids and nets, hand and motor operated rotary rheostats, potentiometers, stud regulators and sliders. Among new products are a short time rated resistor; a traction resistor with new type porcelain insulation; and a range of "Edgewound" vitreous embedded resistors.

**Falk, Stadelmann & Co., Ltd.,** 91, Farringdon Road, London, E.C.1.—**Stand K.15.**—Tungsten lighting fittings include the new glass, flex-suspended "Mercury," "Venus" and "Neptune" range and the "Europa" dining room pendant. There are also a new range of fluorescent lighting fittings; "Metalcast" industrial switches; and the "Snapfast" switch.

**Fenton, Byrn & Co., Ltd.,** Airflow Works, Berrylands Road, Surbiton, Surrey. —**Stand N.3.**—Ventilation and heating products include ring, wall, window and ceiling fans, roof cowls, fan convectors, cabinet heaters, electric unit heaters, kitchen canopies and the ancillaries required for ventilation problems. The company also operates an engineering services department prepared to assist in the design of layouts for installations incorporating its various products, i.e., ventilation, air conditioning and convector heating systems.

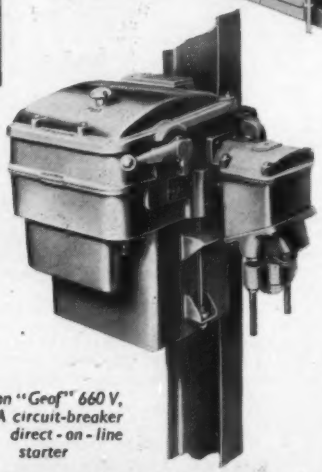
**Ferguson Pailin, Ltd.,** Higher Openshaw, Manchester, 11.—**Stand G.11.**—In addition to an indoor metalclad oil circuit-breaker (33 kV, 1,000 MVA, 2,000 A) and industrial 400/660 V oil break a.c. switchgear, auxiliary products include control switches, combined control and semaphore switches, indicating lamps, small wiring fuses, butyl current transformers and a cast resin voltage transformer. Among new products are a switch-fuse and oil switch (6·6 kV and 11 kV 250 MVA, 400 A); air break switchgear (3·3 kV, 250 MVA, 1,600 A); and air insulated switchgear (6·6 kV, 150 MVA; 11 kV, 250 MVA, 400 A).

**Ferranti, Ltd.,** Hollinwood, Lancs.—**Stand M.9.**—A three-phase, high speed resistor transition on-load tap-changer for 33 kV transformers which the company is exhibiting can be used in either star or delta operation at a maximum full load line current of 300 A on normal tapping and has a maximum of 16 steps. Distribution transformers and h.v. testing equipment and moving coil voltage regulators and static balancers are also shown.

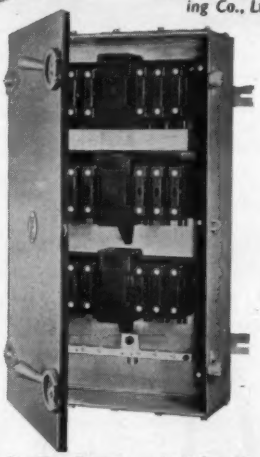
The meter display includes a range of house service types consisting of a.c. single-phase, prepayment and polyphase, and polyphase maximum demand meters.

*Flush fronted cubicle type "Y" switchboard (Electro-Mechanical Manufacturing Co., Ltd.)*

*Erskine Heap multi-motor contactor type switchboard*



*Ellison "Geof" 660 V, 400 A circuit-breaker and direct-on-line starter*



*English Electric "Red Spot" heavy duty fuseboard*

*Ferranti printed circuits applied to package units in the "Pegasus" computer*

The instrument department is represented by several demonstration units and a selection from a wide range of indicating and industrial instruments including hermetically sealed types. A phase-earth loop impedance tester for testing to I.E.E. Regulation 406 is also shown. Instead of working on the current injection principle recommended in Regulation 507, the tester momentarily puts an actual fault from line to earth and is operated by the fault current. Other items are a disturbance recorder; an 11 kV pole type clip-on ammeter; and a proving unit for use with high voltage indicators. A demonstration model of the Ferranti seven-range clip-on voltammeter, type "V," is also shown.

One of the products of the Computer Department is a new high speed paper tape reader, type TR5. It is a fully transistorised photoelectric model capable of operating at speeds up to 300 characters per second. A simple adjustment of a guide adapts the reader for 5, 7 or 8 unit punched paper tape, provision being made for reading all eight channels. Examples of printed circuits applied to packaged units used in the "Pegasus" computer are also on view.

Ceramic-to-metal seals and semi-conductor devices are among the products of the Electronics Department, while the foundry displays castings for the electrical, automobile, refrigerator and small tool industries. Electric fires and convectors including floor, panel and wall types and the recently introduced "Firestreak" silica glass sheathed element type, are shown by the Domestic Appliance Department.

**Fibreglass, Ltd.,** St. Helens, Lancs.—**Stand T.17.**—Several large mouldings, such as those used in the new Ferranti 132 kV transformer on-load tap changing gear, are shown as well as a wide range of fibreglass fabric reinforced laminates, cylinders and mouldings used in switchgear transformers, rotating plant and electronic equipment. As a base for flexible insulation in Class B and Class H equipment the material is represented by varnished cloths and tapes, mica/glass combinations, cables and wires and cords and sleevings.

**H. W. Field & Son, Ltd.,** Harold Wood, Essex.—**Stand R.4.**—On this company's stand are fluorescent lighting fittings and control gear components for all sizes and types of lamps. On show for the first time are the "SPR" plastic diffuser decorative fittings in 2, 3, 4, 5 and 8ft sizes for two or three lamps; these fittings can be made in any continuous length. Another new item is the "Snap-on" louvre made in "pearlescent" white plastic in 8in sections for clipping on to any length of fluorescent lamp. In addition to lighting fittings the company shows a new heat storage bed warmer and an electric fan.

**Fitzgibbon & Murray, Ltd.,** Lower Mill, Ewell, Surrey.—**Stand F.1.**—"Jeani" and "Ewell" electrical accessories, insulating materials, and "Hi-Scale" wire connectors.

**Fractional H.P. Motors, Ltd.,** Rookery Way, Hendon, London, N.W.9.—**Stand J.20.**—"Fracmo" universal, split-phase, capacitor, three-phase, synchronous and shaded pole motors from $\frac{1}{250}$ to $\frac{1}{3}$ h.p.; and geared units of 0·125 to 600 r.p.m. and torque up to 850 lb/in.

**V. & E. Friedland, Ltd.,** Macclesfield, Cheshire.—**Stand C.6.**—Door bells, chiming door bells and a large selection of bell pushes (including illuminated models) are displayed. The company's portable invalid bell is shown on the "Electricity in Hospitals" stand.

**Fuller Electric, Ltd.,** Fulbourne Road, Walthamstow, London, E.17.—**Stand K.18.**—A complete single-phase 132 kV fully insulated tap-changer, developed for use with 120 MVA and larger 275/132 kV auto-transformers for the C.E.G.B., is shown. Various types of selector switch assemblies with elliptical gear drives are demonstrated as well as two types of high speed divertor switches, one of which is identical to that employed on the 132 kV tap-changer. Another working model is a new direct drive tap-changer driving mechanism, developed specially for use

with the company's latest range of high speed resistor tap changers. Among other items are a 5 h.p. variable speed a.c. commutator motor with 6/1 speed range; a 16 kVA 3,830 c/s combined motor and high frequency generator set; a 275 kV capacitor voltage transformer; and a wide range of relays.

**General Electric Co., Ltd.,** Magnet House, Kingsway, London, W.C.2.—**Stands F.7 and W.1.**—The ground floor stand is arranged to represent the range of G.E.C. equipment for the control, distribution and application of electric power in a typical factory. In the 11 kV substation section are a ring main unit, transformer and m.v. airbreak switchgear of the horizontal draw-out type mounted in sheet-steel cubicles. Local supplies are controlled by switchboards built up from the company's "MW" range of switchgear and distributed by busbar trunking, with tap-off units, and fused-tapped or standard cable trunking. Overhead radiant heaters are installed.

Motors shown are from the new range of ventilated machines using Class E insulation, available for outputs of up to 50 h.p. at 3,000 r.p.m. Exhibits of individual starters include representative D.T.L. star-delta and reversing types, and the new range of vertical-lift contactors of 25 A and 50 A nominal. In addition, two types of motor control centre are shown, one containing standard starters and switchfuse units and the other with starters and circuit breakers for use in the oil industry.

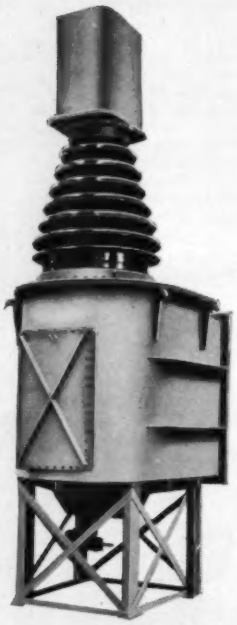
Exhibits of industrial catering equipment in the canteen section include the HO/12 single-oven range, while in the section of the stand representing a manager's office are a section of underfloor ducting; air conditioning unit; "Nightstor" heater; decorative lighting fittings; and typical equipment for call systems, staff location and fire alarm indicator installations.

The main exhibits on the gallery stand are lighting fittings, such as the new "101" range of fluorescent fittings; fluorescent fittings for acoustic tile ceilings; a "Luminated" ceiling; contemporary lighting fittings; and a selection of new glassware. A special exhibit demonstrates a colour matching unit which will produce artificial lighting conditions from "sunlight" to "north daylight." Domestic equipment includes the new "Supreme" cooker with eye-level grill and new 6 and 8 cu ft refrigerators.

**Gent & Co., Ltd.,** Faraday Works, Leicester.—**Stand L.22.**—In addition to a wide selection of electric clocks there are time recorders and programme instruments, and a range of sound signals including industrial and domestic bells and buzzers. Fire alarm systems are also exhibited as well as luminous call systems for use in hospitals; staff location equipment; liquid-level indicating and recording equipment; automatic audible indicators; process timers; burglar alarms, and mains failure alarms.

**W. T. Glover & Co., Ltd.,** Trafford Park, Manchester, 17.—**Stand J.9.**—A wide range of cables for all electrical purposes includes pre-impregnated p.i., v.r.i., and plastic types.

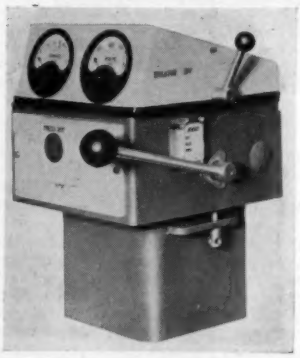
**John Gosheron & Co., Ltd.,** Albert Embankment, Vauxhall, London, S.E.11.—**Stand S.1.**—The Technical Division exhibits a full range of plastic, cloth, and fibreglass tapes for electrical purposes and for anti-corrosion pipe protection, and cable and pipe-wrapping machines. A new p.v.c. tape, "Dilec," in which the adhesive properties are inherent in the



*Fuller single-phase 132 kV fully-insulated tap changer*

*Holophane type F.9912 fitting (left) and type I.3056 high bay unit*

*Hotpoint 8in high-speed radiant ring*

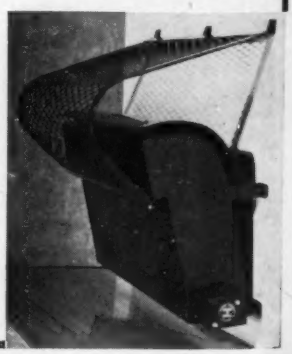


*G.E.C. 150 A oil circuit-breaker*

*Hilmor model "R.P.5" tube bender*

*Heayberd variable a.c. and d.c. supply unit*

*One of the Heatovent range of heaters fitted with a safety guard*



material itself, is also shown, as well as polythene tapes for specialised electrical work and colour coding.

**Gulf Oil (Great Britain), Ltd.,** 6 & 7, Grosvenor Place, London, S.W.1.—**Stand H.8.**—"Gulfsil" transformer switch oils; special insulating oils; inhibited oils; straight and inhibited turbine oils; heavy insulating oils; meter and instrument lubricants; electrical contact lubricants; insulating compounds; electric rotating machinery greases; and time lag dashpot oils.

**G.W.B. Furnaces, Ltd.,** Dibdale Works, Dudley, Worcs.—**Stand G.13.**—One separate open frame contains a selection of the G.W.B. contactors which range from 10 to 1,400 A a.c. and d.c. so that special features, such as sintered tungsten-silver contact faces which are fitted where applicable, may be examined. A second open frame contains a selection of isolators which range up to 1,400 A.

**Hackbridge & Hewittic Electric Co., Ltd.,** Walton-on-Thames, Surrey.—**Stand O.2.**—Among the company's exhibits are a high power mercury arc rectifier unit employing cooled-cathode type bulbs; germanium rectifier cells; a rectifier reversing drive demonstrating particularly the operation of a current limiter over a range of inversion, as well as rectification using static electro-magnetic controls; "Metalectric-Hewittic" high frequency equipment for welding; transformer equipment including a dry type unit with Class C insulation; on-load tap-changing equipment, and a range of h.v. outdoor overhead line switchgear equipment in ratings up to 33 kV 1,200 A.

**Harris & Sheldon (Electrical), Ltd.,** Ryder Street, Birmingham, 4.—**Stand J.15.**—"Handslite" fluorescent and tungsten lighting fittings and ancillary products are exhibited in addition to a large number of new designs of fluorescent fittings, decorative glass pendants and matching brackets. Also on view is the company's "Luve-Line" decorative fluorescent system.

**Hawke Cable Glands, Ltd.,** Ashworth Street, Denton, Lancs.—**Stand T.19.**—Apart from "Hawke" cable glands and sealing boxes other products are joint boxes, through boxes and sealing ends for busbar termination. A flameproof junction box (circular type), plastic gland covers, and cable glands manufactured from plastic materials are among new products.

**L. G. Hawkins & Co., Ltd.,** 30–35, Drury Lane, London, W.C.2.—**Stand J.4.**—A complete range of domestic electrical appliances includes tea-making sets, food trolleys, irons, toasters, hand lamps, urns, boilers, kettles, etc. The new "Fair Lady" hair dryer and an augmented range of "Sunray" convectors are also on view, as well as the new "Hi-Dry" clothes dryer and airer.

**Heatovent Electric, Ltd.,** Lomond Street, Glasgow, N.2.—**Stand G.17.**—A wide range of domestic and industrial heating equipment includes convector heaters, fan heaters, panel heaters as well as flameproof and radiant units.

**Heatrae, Ltd.,** Heatrae Works, Norwich.—**Stand N.4.**—A representative display of thermal storage water heaters and immersion heaters includes the "Lido" water heater in three capacities (1½, 2·2 and 3 gal). The "Saferod" high level safety heater has been restyled and an industrial version, the 3 kW "Multirod," is shown.

**F. C. Heayberd & Co., Ltd.,** Greenwich South Street, London, S.E.10.—**Stand T.13.**—Examples of power transformers range from 2 to about 50 kVA and include models for l.v. lighting and for the safer operation of hand tools. Battery chargers and rectifier units are also shown and a variable a.c. and d.c. supply unit suitable for school science rooms is exhibited for the first time, together with a prototype of a similar equipment employing germanium rectifiers.

**Hedin, Ltd.,** Raven Road, South Woodford, London, E.18.—**Stand F.10.**—Industrial heating equipment includes band, strip, cartridge and asbestos woven net type heating elements; panel heaters; electric furnaces; ovens; and a humidity cabinet controlled by adjustable wet and dry bulb thermometers. A new oven has improved shell construction and duct design providing, it is claimed, more uniform temperature distribution.

**Heenan & Froude, Ltd.,** Worcester.—**Stand T.2.**—A "Heenatone" programme control unit, which enables any number of operations to be planned in any required sequence and then carries them out entirely automatically, is displayed. There is also a selection from the standard range of air cooled slip couplings which cover duties up to approximately 100 h.p. for constant torque drives and higher for fan and similar drives. For heavier duties, water cooled couplings are available, these being capable of powers up to approximately 600 h.p. with very wide speed ranges. A number of electronic control units are also shown and the Mark I, G.V.A.L. electronically controlled "Heenan-Dynamatic" dynamometer for testing engines, turbines, electric motors, vehicles, transmissions, gearboxes, etc.

**Hellermann, Ltd.,** Tinsley Lane, Crawley, Sussex.—**Stand U.7.**—The Cable Accessories Division is demonstrating the Hellermann binding system—a method of binding, insulating and identifying cable ends by fitting a rubber or plastics sleeve under tension with a three-pronged expanding tool. Cable clips, cable strapping and studs, and cleats are among other exhibits and the standard range of wiring tools now includes the new H.30 automatic wire stripper.

The Terminals Division is showing solderless connectors, fitted with hand or foot operated compression tools; the Plastics Moulding Division mouldings in both thermoplastic and thermosetting materials; the Plastics Extrusion Division extrusions in p.v.c., polythene, cellulose acetate and nylon; and the Sealing Devices and Connectors Division components designed to waterproof and pressurise cable assemblies.

**W. T. Henley's Telegraph Works Co., Ltd.,** 51–53, Hatton Garden, London, E.C.1.—**Stand J.14.**—Representative samples from a wide range of cables and distribution equipment include power cables up to 132 kV and all types of wiring cables and flexible cords. A sample of a new 25 kV concentric oil filled cable which the company has designed for the new system of single-phase a.c. supply to British Railways is also on view, as well as multicore compound rubber insulated and sheathed (screened and unscreened) signalling cables. Power station cabling is represented by a display showing the work being carried out at the Chapelcross nuclear station where some 220,000 yd of Henley cables is being installed.

Terminating glands for wire armoured plastic cables are demonstrated, other cable exhibits include flexible armoured, mineral insulated and a wide range of plastic insulated types. Among distribution equipment are such items as consumers' control units, service fuses, pillars and panels and underground disconnecting boxes.

**Higgs Motors, Ltd.,** Witton, Birmingham, 6.—**Stand T.1.**—A small selection of the company's extensive range of motors includes screen protected and totally enclosed fan cooled types built to the latest B.S. specification. There is also a selection of geared motor units and examples of a new range of drip-proof squirrel cage motors with Class E insulation.

**Hilmor, Ltd.,** Caxton Way, Stevenage, Herts.—**Stand Y.2.**—Hand operated and hydraulic machines to bend from ½ to 2in conduit are demonstrated. The model "R.P.5" bender, shown for the first time, is mounted on a portable stand and has a capacity for up to 1½in conduit. It is operated through a powerful ratchet and screw and is claimed to produce all bends required for normal installation purposes.

**Hirst Electronic, Ltd.,** Gatwick Road, Crawley, Sussex.—**Stand L.23.**—Among this company's exhibits are high-speed contactors (20 to 1,200 A) for welding; an automatic indexing welder for spot and projection welding, complete with control equipment for welding electrical switchgear parts; and a range of welding timers and controllers, saturable reactors, rectifiers and transformers.

**Hollman, Oswald, Ltd.,** 208, Kent House Road, Beckenham.—**Stand Y.11.**—Many new lighting fittings, table standards and lampshades are displayed.

**Holophane, Ltd.,** Elverton Street, Westminster, London, S.W.1.—**Stand H.16.**—Prismatic lighting units on display cover flameproof, dustproof and vapour-proof fittings for special applications in atomic and oil refinery plant, chemical processes and all hazardous areas. Enclosed industrial pendants with anti-corrosive finishes are shown, together with general purpose fittings for high and low bay installations. Of particular interest in the range is the type I.3056 high bay unit modified to take the latest 1 kW MBF lamp with a rated life of 5,000 hours and an average life output of 45,000 lumens. Pressure-purged lighting for hazardous areas is represented by type F.9912 reflector bowl cast pendants.

The company is also showing its latest fluorescent range, the "Holoflux System," with plastic optical louvres providing a method of prismatic light control suitable for a wide range of commercial lighting applications. Other fittings include the "In-Bilt" range of tungsten fittings for architectural built-in schemes and units for offices, banks, stores, churches and municipal buildings.

**Homeshade Co., Ltd.,** 99, Baker Street, London, W.1.—**Stand U.6.**—This company shows "Silapal" lamps with internal coatings which are claimed to provide light without glare and to be both efficient and decorative. Modern fittings incorporating these lamps are displayed.

**Honeywell-Brown, Ltd.,** 1, Wadsworth Road, Perivale, Middlesex.—**Stand V.4.**—A comprehensive selection of micro switches includes sub-miniature, general purpose, high capacity, and industrial housed types.

**Hoover, Ltd.,** Perivale, Greenford, Middlesex.—**Stand X.1.**—In addition to the Mark II range of f.h.p. motors the

company displays its Mark IV f.h.p. motor, split phase capacitor start, and three-phase types. The latter range is shown with foot, resilient, and lug mounting as well as with B.S. flange mounting. Stator-rotor units for hermetic refrigerator systems and a display panel of moulded commutators are also on view as well as a range of domestic products, including the new "Hoovermatic" combined washing machine and spin dryer.

**Hotpoint Electric Appliance Co., Ltd.,** Crown House, Aldwych, London, W.C.2.—**Stand D.4.**—A wide range of domestic electrical appliances includes storage water heaters and immersion heaters; refrigerators; "Pylon" electric kettles, all fitted with "Torribar" sheathed wire elements as standard; vacuum cleaners; and convector heaters. The company's recently developed radiant rings are also displayed and visitors will be able to see how the resilient D-shaped element makes close contact with the most uneven pans and why it heats quickly and responds promptly to the switch.

**Hume Atkins & Co., Ltd.,** 66, Victoria Street, London, S.W.1.—**Stand S.14.**—Lighting fittings for schools, hospitals and offices; a contemporary area lantern; and fluorescent fittings in colour.

**A. H. Hunt (Capacitors), Ltd.,** Bendon Valley, Garratt Lane, Wandsworth, London, S.W.18.—**Stand O.1.**—All kinds of fixed capacitors including electrolytic, metallised paper, metallised film, foil and paper, plastic film, stacked mica, silvered mica, ceramic, power ceramic and transmitting types are displayed. New products include an increased range of "Therminol" power factor improvement capacitors with non-inflammable impregnant and coolant and with reduced dimensions; type L89/5 oil filled types for street lighting installations; and capacitors for induction furnaces.

**Igranic Electric Co., Ltd.,** Bedford.—**Stand U.4.**—New products include a range of heavy duty oil-tight control units, which comprises push-buttons, selector switches and indicating lights. Less than 1¼in of back panel space is required and contact blocks can be stacked, permitting a multiplicity of circuit arrangements. The new unit construction block type contactors cover 10, 20, 30 and 50 capacity and main features are convenient snap-on covers removable without the aid of tools; unit construction facilitating mounting; and up to 5 main poles if required. The "Igrastat" relay is a new type of static control gear that is claimed to offer many advantages over electromagnetic control relays. Only four basic plug-in units are required to produce a multiplicity of control circuits. An experimental 5 h.p. magnetic amplifier drive unit is also exhibited. Typical applications are speed control; tension control (utilising a variable torque drag brake); wire drawing; and traction (employing a d.c. series motor).

**Alfred Imhof, Ltd.,** Ashley Works, Cowley Mill Road, Uxbridge.—**Stand Q.6.**—Standard instrument cases, racks, control consoles, handles and accessories and prototypes of a heavy duty rack designed for electrical control equipment.

**Imperial Chemical Industries, Ltd.,** Kynoch Works, Witton, Birmingham, 6.—**Stand V.1.**—Recent developments in new metals and new forms of traditional metals for applications in nuclear power stations include wrought titanium, niobium, beryllium, zirconium and vanadium. The Nobel Division shows its range of silicone products manufactured for the electrical industry. New and improved silicone resins for laminating and impregnating are displayed.

**Industrial Tapes, Ltd.,** Speedfix House, 142–146, Old Street, London, E.C.1. — **Stand N.9.** — "Speedfix" pressure-sensitive materials developed for coil winding, motor winding, f.h.p. motor commutator solder dipping resists, resists for electroplating, high temperature insulation materials, etc., are displayed. New products include "Speedfix" aids in the making of printed-circuit master drawings and pressure-sensitive glass for the strapping of oil pipe heating tracers.

**Insuloid Manufacturing Co., Ltd.,** Sharston Works, Leestone Road, Wythenshawe, Manchester.—**Stand Q.4.**—The "Cradleclip" wiring system consists of binders and endless extensible clips for anchored wiring. Binders and cradles are moulded from tough nylon and the clips are of p.v.c. Busbar insulation is another product of the company. The process consists of shrinking on the bars a close-fitting sleeve of hard plastic insulation to provide a permanent high dielectric non-ageing and "non-tracking" protection. The latest addition to the company's range of cable clips is the "NX" type which has twice the strength and only half the weight of the "X" clip. Another development is the type AS adjustable cable saddle.

**Ioco, Ltd.,** Netherton Works, Anniesland, Glasgow, W.3.—**Stand R.13.**—Laminated plastics; electrical insulating cloths and tapes; and materials for printed circuits.

**Isopad, Ltd.,** Barnet By-Pass, Boreham Wood, Herts.—**Stand G.16.**—"Isotapes," flexible metal heating tapes, made in standard lengths from 3 to 300ft and from 1 to 4in wide, are shown in seven different kinds, ranging from a high-temperature quartz tape to a weatherproof tape used for frost protection on external pipelines. Apart from industrial equipment, heaters for laboratory use are demonstrated and there is also a full range of "Lana" domestic electric blankets.

**Jackson Electric Stove Co., Ltd.,** Dallow Road, Luton, Beds.—**Stand R.14.**—A full range of domestic electrical appliances includes electric cookers ranging from the "Giant" table cooker to the latest "Joy" series model No. 396J, incorporating an "eye-level" grill and other special features. Colourful convector heaters, an attractive range of electric fires in a selection of "House and Garden" colours, washboilers and the "Jill" 3 and 1½ gal model water heaters are also displayed.

**Jeary Electrical Co., Ltd.,** 132–142, East Road, London, N.1.—**Stand K.10.**—The company is concentrating on industrial equipment including geared f.h.p. motor units; exhaust and axial flow fans, including polythene fans for fume cupboards; and auto change-over switches. The new "Engart" streamline "Crossvent" axial fans are also displayed. These are particularly valuable in applications where the fan is required to handle contaminated air, hot air or gas, or any airborne matter, since the motor is completely separated from the air stream. They are available in a range of 12 to 72in blade diameters.

**Johnson, Matthey & Co., Ltd.,** 73–83, Hatton Garden, London, E.C.1.—**Stand V.7.**—The contact display includes headed types, silver on copper tubular rivets, tungsten on mild steel composite contacts, and silver on steel button contacts. Basic materials such as contact bimetal, Mallory 73 beryllium copper, JMC phosphor bronze, elkonites and silver D-section strip are shown, and other exhibits include Mallory castings for switchgear, low temperature brazing alloys, precision-drawn resistance wire, silver fuse materials, silvered mica plates and capacitors and materials for the electrodeposition of noble metals.

**Richard Johnson & Nephew, Ltd.,** Forge Lane, Manchester, 11.—**Stand L.16.**—Copper wire and strip for the electrical industry and composite conductors for power distribution.

**Johnson & Phillips, Ltd.,** Charlton, London, S.E.7.—**Stand E.8.**—In a comprehensive display of h.v. and l.v. switchgear, transformers, capacitors and cables is the new "N.X." non-extensible ring main unit with spring operated manual closing mechanisms on the oil switches which provide an extra margin of safety. It is designed so that, after initial compression, the springs take the action of the switches completely out of the operator's hands. It has a 400 A normal current rating with the oil switches rated at 250 MVA at 11 kV. Among other switchgear exhibits is a double-busbar metalclad unit that is available in air-insulated or compound filled form. A new method of jointing paper or p.v.c. insulated cables by the use of epoxy resins is shown.

**Jones & Stevens, Ltd.,** Long Lane, Littlemore, Oxford. — **Stand T.26.** — Miniature electric motors (10 to 50 W input); reduction gears; infinitely variable speed transmission; solenoid valves; and the new "Minex" (Mk. II) extractor fan.

**Kent Bros. Electric Wire Co. & E. H. Phillips, Ltd.,** Kew Works, Bracknell, Berks.—**Stand J.3.**—High conductivity copper winding wires and strips insulated with cotton, silk, rayon, paper, enamel and synthetic enamel.

**Klaxon, Ltd.,** 49, Upper Brook Street, London, W.1.—**Stand L.2.**—Exhibits include new shaded pole motors, type "BMQ," for applications in projection equipment, convector heaters, communications equipment, display, industrial instruments, etc. Ratings range from 1/500 to 1/350 h.p. at 1,200 r.p.m. Other items include f.h.p. geared motor units; industrial audible warning signals; sign flashers; signal flashers; staff locators; and "Latex" test apparatus.

**Laboratory Equipment (London), Ltd.,** Libra Works, 18–20, Dames Road, London, E.7.—**Stand Y.6.**—"Weyco" laboratory equipment includes an automatic climatic cabinet; a new airflow laboratory oven; and a heavy duty stirrer.

**Ladybird Appliances, Ltd.,** Reliance Works, 20, Oxford Road, Wokingham, Berks.—**Stand S.6.**—The "Ladybird" 16in rotary lawn mower and a self-propelled mower are on view. A power conversion unit is also shown fitted to several makes of lawn mowers. An improved version of the company's floor and furniture polisher has new type brush bearings and pop-on nylon fur polishing pads.

**Lancashire Dynamo Nevelin, Ltd.,** Hurst Green, Oxted, Surrey.—**Stand D.5.**—A direct-to-mains "Varionic" variable speed drive incorporating a steel tube "Nevitron" single anode rectifier is exhibited for the first time. The "Nevitron" single anode mercury arc rectifier

using a glass envelope was introduced some five years ago. That development is now taken a stage further by the introduction of the steel tube "Nevitron" which is more robust and can be made for larger outputs. Another new product is a monitored earth safety unit which has been developed to safeguard the operator when using portable equipment from a mains supply. To meet the growing requirements for a central control point for all distribution and motor starting circuits a load centre switchboard is displayed.

**Langley London, Ltd.,** Kelvin Way, Crawley, Sussex. — **Stand N.15.** — As specialists in the manufacture of mica, micanite and laminated plastic materials, the company displays a wide range of insulating materials.

**Laurence, Scott & Electromotors, Ltd.,** Norwich.—**Stand L.11.**—Numerous working exhibits demonstrate variable-speed machines and control systems. Another running exhibit is a demonstration of low speed gearless squirrel-cage motors supplied at low frequency, an arrangement which has particular advantages for drives involving frequent starting, reversal or inching, or for providing a low speed (additional to the speed on normal frequency) for setting-up, maintenance of driven plant, etc. A working model of the "Revcon" system applied to a crane hoist motor is shown. This system provides a wide range of speed, and stable control of low speed at any load without frictional braking, with a single-unit slip-ring motor.

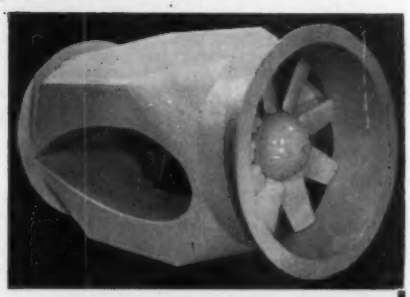
Static exhibits include (in the fourecourt, on account of weight and size) a weather-proof N–S variable speed a.c. motor of 860/57 h.p., 790/316 r.p.m., with air/air heat exchanger, for the drive of the induced draught fan of a 100 MW set. Control gear will be represented by a draw-out type unit housing starters for fifteen squirrel-cage motors, providing maximum accessibility but occupying a floor space of only 45in by 20in.

**Lee Guinness, Ltd.,** Newtownards, Northern Ireland.—**Stand R.10.**—A new range of automatic a.c. motor control gear is being presented, a feature being the "Vapormatic" rheostat which applies a new technique to the control of slipring motors, giving smooth acceleration over a wide range of starting conditions. The "Vapormatic" exhibit comprises the sectioned rheostat, examples of complete starters for 40 and 80 h.p., oscillographs of actual test results illustrating the starting characteristics and a display of application photographs.

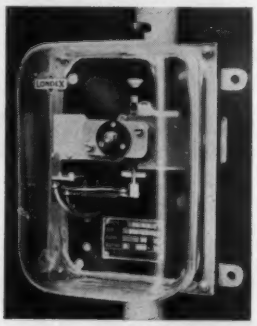
**Lewden Metal Products, Ltd.,** 5, Argall Avenue, Lea Bridge Factory Estate, Leyton, London, E.10.—**Stand L.6.**—This exhibit consists mainly of weather-tight fittings including 5 and 15 A switches up to three-gang, 5, 15 and 30 A with three or four pins (also five pins in 15 A), cable couplings in all standard gauges, interlocking and non-interlocking switch plugs, surface mounting and box or batten mounting plugs and sockets, two-way adaptors, and tee couplings. Other items displayed include a full range of hooks and hook plates, weathertight packing glands, bonding nipples, flexible tubing adaptors, switch units up to eight gang, 5 and 15 A switch plugs, switch indicating units, industrial flexible-arm lamps and pottery lamps.

**Light & Power Accessories Co., Ltd.,** Wellesley Works, Wellesley Road, Wood Green, London, N.22.—**Stand K.27.**—On this stand are non-ferrous metalclad

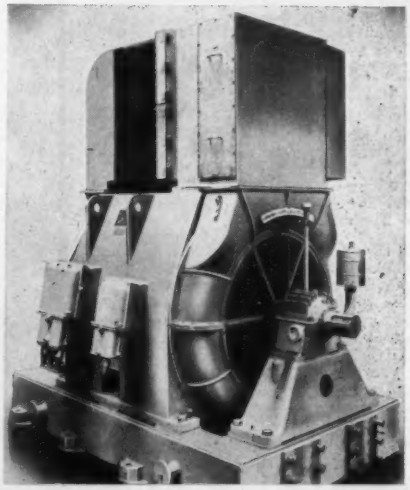
*Hunt type L89/5 oil filled capacitor*



*Engart "Crossvent" axial fan (Jeary Electrical Co.)*

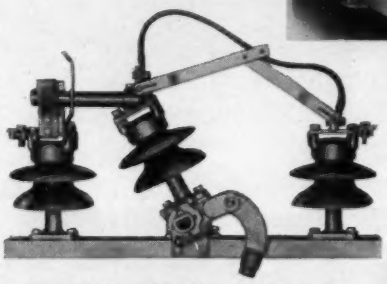


*Londex d.c. reverse current relay*



*An 860/57 h.p., 790/316 r.p.m. variable speed a.c. motor (Laurence, Scott & Electromotors, Ltd.)*

*Below: "Isodrum" heater shown in use recovering the residue of viscous material from an "empty" barrel (Isopad, Ltd.)*



*200 A 11 kV rural pattern, three-insulator rocking switches (Line Equipment, Ltd.)*

*Hoover Mk IV f.h.p. motor with foot mounting*

weathertight electrical fittings, plugs and sockets, switch sockets, switches, etc., from ½ to 250 A; safety shuttered type components in which no size or type is interchangeable with another; and a new range of rubber-covered plugs and sockets.

**Line Equipment, Ltd.,** 32, Queen Victoria Street, London, E.C.4.—**Stand U.7.**—The company manufactures high voltage, air-break switch- and fusegear, for use outdoors, for systems up to 400 kV. Exhibits include rocking and rotating type isolating switches for various voltages, together with manual, spring, motor and pneumatic operating mechanisms; "Load-Break" switches with new interrupter heads showing the latest type of improved mounting; and redesigned standard and repeater expulsion fuse cut-outs, successfully tested to 150 MVA, three-phase for both 11 and 33 kV units. Other exhibits include rewirable liquid fuses, expulsion fuse links of various types, fuse isolators and a new range of connectors for stranded, solid or tubular conductors. A complete spring operated fault throwing switch is also on view.

**Lintronic, Ltd.,** 149, Strand, London, W.C.2.—**Stand T.3.**—A portable 10 kV tester which may be operated as a hand generator or energised from a.c. mains; a live line detector for use on overhead power lines; and an overhead line resistance bridge are displayed.

**Londex, Ltd.,** 207, Anerley Road, London, S.E.20.—**Stand J.5.**—The range of relays has been further extended since the last exhibition, particularly the miniature types. There are two new busbar relays and a special d.c. reverse current relay. A photo-transistor unit which occupies only a quarter of the space required by conventional equipment is seen operating, and a working display of counting devices, electronic, batch, electromagnetic, auto-resetting, etc., enables any visitor with an industrial counting problem to assess the merits of each type. Eight process timers are shown.

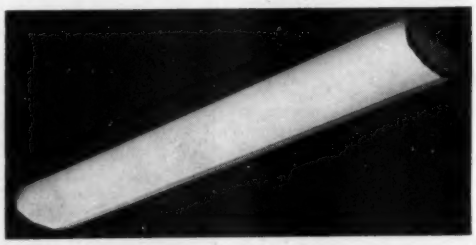
The demand for flameproof and intrinsically safe equipment has increased during the past year and the company is now able to offer many units of this type. The "Lectralevel" floatless liquid level control system is arranged as a working exhibit together with a display of electrodes and holders. Other items are level controls for bulk materials such as coal, ore, grain, cement, etc. New additions to the range of pressure and vacuum switches, a power factor regulator, a rotation sensing device, a float switch, winker beacons, flow indicators, an electronic relay and an air flow switch are other exhibits.

**London Electric Wire Co. & Smiths, Ltd.,** 24, Queen Anne's Gate, Westminster, London, S.W.1.—**Stand L.4.**—The display includes products of the associated companies, Frederick Smith & Co., the Liverpool Electric Cable Co., Ltd., and Vactite Wire Co., Ltd., and covers "Lewcos" insulated wires and strips; "Anacos" bare copper and copper alloy rods, wires, strips, strands, sections and forgings; "Salcos" aluminium and aluminium alloy wires and strands; "L.E.C." cables and flexibles (rubber, thermoplastic, paper and cambric insulated); Vactite resistance wires and tapes in "Vacrom" (nickel-chrome), "Eureka" (cupro-nickel) and "Alloy 653"; molybdenum rods, wires and tapes; and pure nickel and special wires for the electric lamp, radio and electronic industries.

**London Transformer Products, Ltd.,** Cobbold Estate, Willesden, London, N.W.10.—**Stand N.7.**—Power and distribution transformers; class "H" 500 kVA transformers; pole mounting units to T.1 specification; industrial transformers for electric furnaces; radar, radio transmission, signal and tunnel lighting units; low voltage transformers for all purposes; "C" core and resin cast transformers; earth leakage protection units; and a laboratory rectifier.

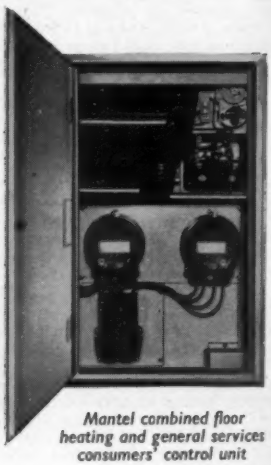
**Long & Crawford, Ltd.,** Gorton Road, West Gorton, Manchester, 12.—**Stand T.16.**—Units representative of the company's standard range of outdoor switchgear suitable for 11 kV service include oil switches; oil fuse switches, and oil fuse circuit-breakers; and a ring main unit of the non-extensible type. A new outdoor 400 A 11 kV oil circuit-breaker and indoor circuit-breakers for currents up to 1,200 A and rated at 250 MVA at 6·6 to 15 kV are shown for the first time.

**Lord's Controls, Ltd.,** 15, Victoria Avenue, Camberley, Surrey.—**Stand T.12.**—New products on display are the "Reli-Alarm." which gives 18 signalling sequences by a combination of three coloured lights with "flashing" or "steady" indication, including remote and local "accept" or reset and testing



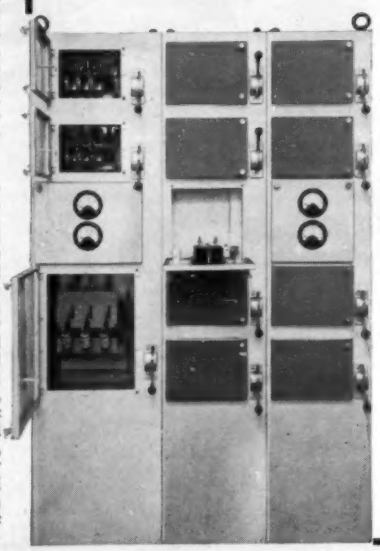
*Lumitron "Perspex" twin 5ft fluorescent fitting*

*Maclaren type M.O. rod pattern oven thermostat*



*Mantel combined floor heating and general services consumers' control unit*

*Magicook Appliances "Magicair" fan heater*



*Met-Vick type CMC 3-cubicle switchboard*

facilities from the front panel; a smoke density alarm unit; and a constant arc control unit that automatically maintains the length of the arc between the electrode and the work on round, flat or undulating surfaces when used with argon gas arc welding equipment.

**M. & J. Lossos & Co., Ltd.,** 29–31, Beethoven Street, London, W.10.—**Stand T.15.**—The "Kaloric" range of electric convectors has been extended and now includes a new contemporary model. A redesigned 3 kW wall mounted unit heater and others of from 4 to 20 kW are also being shown, as well as heater batteries and grain dryers.

**Lumitron, Ltd.,** 180, Shaftesbury Avenue, London, W.C.2.—**Stand R.9.**—A number of new recessed and surface spotlight fittings for shop and showroom lighting are shown in addition to fluorescent lighting fittings based on a new standard spine. Apart from the range of plastic and metal egg-crate louvre panels, the company is showing for the first time corrugated vinyl white diffusing sheetings for replacement purposes in existing suspended ceilings.

**Arthur Lyon & Co. (Engineers), Ltd.,** 6, Carlos Place, Grosvenor Square, London, W.1.—**Stand H.19.**—In addition to standard and "Newphase" alternators the company introduces a new "E.S." range of small alternators. These machines are self-exciting and self-regulating and intended for unity p.f. load applications where the voltage regulation requirements are less stringent. A further feature is the inclusion of additional windings for 24 V engine starting and battery charging. They are at present being manufactured with outputs of 3 to 11·5 kVA, 50 c/s, 1,500 r.p.m., and 3 to 12·5 kVA, 60 c/s at 1,800 r.p.m.

**Robert Maclaren & Co., Ltd.,** Eglinton Works, Kilbirnie Street, Glasgow, C.5.—**Stand H.6.**—This year the company is introducing for the first time a rod pattern oven thermostat, the Maclaren type M.O., for domestic cookers. Among other thermostats and control instruments shown are the type M.B. for domestic water heating and a thermo-time regulator instrument that links mechanically a thermostatically sensitive element and a clock to give a temperature-time programme.

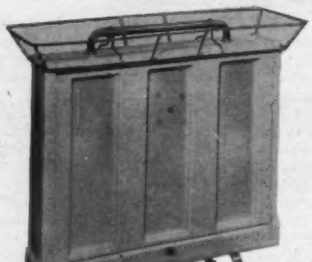
**William McGeoch & Co., Ltd.,** Warwick Works, 46, Coventry Road, Birmingham, 10.—**Stand F.9.**—Watertight sockets and plugs include a multi-pin pattern which can now be supplied with up to 157 pins. Among indicator light fittings, No. 7773 is available for use on low voltage (6 to 24 V), or alternatively for mains voltage. Series LV and M can be fitted with a small e.s. lampholder to take 12 mm (American) or 14 mm (English) thread lamps. Special features of these fittings are ample ventilation with minimum light spill at back of panel, ease of re-lamping from front of panel, and the position of the lamp enables the light to be easily seen from the sides.

**Magicook Appliances, Ltd.,** Shirland Mews, London, W.9.—**Stand X.2.**—A comprehensive range of kitchen equipment includes the "Magicair" fan heater; the "Magicook" de-luxe infra-red cooker; and the "Princess" infra-red domestic grill.

**Major Equipment Co., Ltd.,** 22, Gorst Road, London, N.W.10.—**Stand K.9.**—Among the company's products is a choke control panel having thirty-six 2 kW and four 5 kW choke ways together with thirty-six additional switchways all arranged on two grand master controls. This panel was produced in collaboration with the B.B.C. Engineering Division for the new television studios at Gosta Green, Birmingham.

*Flameproof push-button switch from the M. & C. Switchgear range*

*Major choke type dimmer control panel*



*M.E.M. 1 kW "Memrad" radiator with clothes drying and airing facilities*

**Mantel Metalworkers, Ltd.,** 121, Gurney Street, Walworth, London, S.E.17.—**Stand K.8.**—The range of equipment shown includes consumers' control units, switch fuse service units, the "Mantel" rising main system, rising main distribution boards, "Zedlok" and "Springlok" cable trunking, a cable tap system, a Mantel cable trunking system for lighting fittings, skirting trunking, an underfloor duct system, busbar chambers and instrument cases. A new product is a combined floor heating and general service consumer's control unit.

**Marbourn, Ltd.,** Roslyn Works, Roslyn Road, South Tottenham, London, N.15.—**Stand N.6.**—New products to be shown for the first time include redesigned 13 A switch sockets and plugs, surface and flush patterns.

**Marryat & Place, Ltd.,** 40, Hatton Garden, London, E.C.1.—**Stand G.15.**—The "Barduct" electrical distribution, a busbar system employing fused tapping boxes, is particularly suitable for installation in machine shops and other situations where quick and convenient connection to the electrical supply is required for a number of machines or appliances. This trunking is available in ratings up to 250 A per phase and employs fully shrouded conductors which permit a very compact arrangement.

**Martindale Electric Co., Ltd.,** Westmorland Road, London, N.W.9.—**Stand H.3.**—Two new industrial vacuum cleaners are being shown. One, the "Martinet," will pick up liquids as well as dirt and consists of any standard Martindale portable blower mounted on a rustproof 4 gal tank, on wheels, with filterbag, hose and suction tool attachments. The other is the "Port-a-vac" which consists of a lightweight harness of fabricated steel with canvas supporting straps, to which is attached a standard Martindale portable blower. Also on the stand is seen the "Super Siren," a fire warning device for factories and similar premises; portable industrial blowers; the "Marker," an improved version of the popular "Markit" vibratory marking tool; pulley gear, flywheel and bearing equipment.

**M. & C. Switchgear, Ltd.,** Kelvinside Works, Kirkintilloch, Glasgow.—**Stand L.1.**—A selection of switch and control gear includes the "Unicube" type D464 m.v. group control motor starter assembly comprising a series of standard cubicle units built into board formation; the D431 unit type motor control and distribution gear; oil-break switchgear; and a varied selection of push-button switches designed for use with automatic starters and control gear and for the remote tripping of circuit-breakers.

**M.C.B. Co. (Manchester), Ltd.,** Lupus Works, Oxford Road, Altrincham, Ches.—**Stand G.19.**—The exhibits form a comprehensive display of "Lupus" miniature circuit-breakers and distribution gear. The circuit-breakers range from 1·5 to 50 A. A collection of m.c.b. boards from one-way s.p.n. to 12-way t.p.n. is shown as well as various types of laboratory control panels. Double-pole and triple-pole designs make use of standard single-pole mechanisms suitably coupled so that a fault on any one pole will trip all poles. Also on show is the shunt-trip "Lupus" m.c.b. for the

remote tripping of any circuit rated up to 60 A. Any number of such circuits may be tripped from a control point.

**Mersey Cable Works, Ltd.,** Linacre Lane, Bootle, Liverpool, 20.—**Stand K.20.**—The feature of the display is the recently introduced range of "Merad" (irradiated modified polythene) and "Merflon" (p.t.f.e.) equipment wires, tapes and sleeving. A test rig, which demonstrates the heat resistance of "Merad" compared with conventional polythene insulation, is in operation. The company includes in its display of aerial cables an example with an aluminium conductor of the type recently supplied to the specification of the Central Electricity Authority of Malaya. Similarly, large installations in three recently constructed Palm Line ships are represented in the range of ship wiring cables. New types of ship cables with butyl rubber insulation are included. There is also a comprehensive selection of wiring cables, cords and flexibles with different insulations and sheathings, welding cables, thermoplastics, insulated power and multicore control telephone and signalling cables, and mining cables.

**Metropolitan-Vickers Electrical Co., Ltd.,** Trafford Park, Manchester, 17.—**Stand O.3.**—The principal exhibits on this stand are a number of small motors, including a 10 h.p. type KN–C ventilated squirrel-cage motor, a 2 h.p. type KN–B totally-enclosed fan-cooled motor, and a flameproof induction motor; a 330 kV single-phase assembly and control kiosk of a type GA 11W8 air-break circuit-breaker; a three-panel type CMC switchboard; an improved version of the company's standard infra-red projector, incorporating a tubular metal-sheathed heating element; a weatherproof electrical radiant heater utilising metal sheathed elements; "Redring" boiling plates; instruments and meters, including switchboard and control board mounting instruments, the company's latest polyphase watt-hour meters, and the "Transva" meter for the measurement of three-phase kVAh and kVA demand; and a display of "Magistor" photo-transistor relays.

**Metway Electrical Industries, Ltd.,** Metway Works, Brighton, 7.—**Stand G.2.**—Domestic and industrial repiacement elements, wiring accessories, and electrical appliances are shown. Several new items include the "Multi-Lockway" and "Exaktway" terminal blocks and a new range of "Silver-Luxe" industrial lighting fittings. A 750 W boiling ring, a 750 W 2-pint electric kettle, and a 12 V car kettle are other new exhibits.

**Micanite & Insulators Co., Ltd.,** Empire Works, Blackhorse Lane, Walthamstow, London, E.17.—**Stand U.3.**—In addition to such products as mica, micanite, "Paxolin" synthetic resin bonded laminates, high voltage bushings, fibrous materials, p.v.c. and other thermoplastics, the company displays more specialised materials including silicone electrical insulation in various forms, "Melinex" faced micanite and ethoxyline varnished glass.

**Midland Electric Manufacturing Co., Ltd.,** Tyseley, Birmingham, 11.—**Stand E.6.**—Besides a full range of l.v. switch- and fuse-gear for lighting and power, the company is exhibiting protective control gear for all motors from ¼ to 15 h.p. including direct starting, star-delta and reversing types arranged for push-button or manual operation, and a range of electrical accessories for domestic and industrial use. Among new products are the 2 kW "Memvek" convector; a contemporary styled 1 kW "Memrad" radiator, with clothes drying and airing facilities; the "Rotovair" fan heater in a polished wood cabinet, walnut or mahogany finish; another version of the popular "Memray" wall mounting fire; and socket and switched socket outlets to B.S. 1363 with BMA plates, including new industrial patterns.

**Midland Silicones, Ltd.,** 19, Upper Brook Street, London, W.1.—**Stand L.20.**—Silicones in the form of impregnating and coating varnishes, bonding resins, elastomers, compounds and bearing greases are displayed. Shown for the first time are new British-made silicone rubbers which will cure at room temperature on the addition of a catalyst. The electrical insulating properties of the cured rubbers are good and the rubbery properties are maintained over a temperature range of −50 to +200 deg C.

**Minerva Mouldings, Ltd.,** Minerva Works, Raans Road, Amersham, Bucks.—**Stand L.26.**—Compression mouldings for extensible terminal boards, connector blocks, ammeter and voltmeter bases and covers, ammeter switches, voltmeter switches, moulded circuit-breaker bases, moving contact barriers and moulded barriers.

**M.K. Electric, Ltd.,** Wakefield Street, Edmonton, London, N.18.—**Stand M.10.**—Electrical accessories of all types for both domestic and industrial installations. Recent introductions include new ranges of 20 A switches and 13 A neon pilot-lamp switch-sockets.

**Monsanto Chemicals, Ltd.,** Monsanto House, 10–18, Victoria Street, London, S.W.1.—**Stand S.20.**—The main product featured is "Pyroclor" fire-resistant cooling fluid for transformers. The advantages of "Aroclors" as capacitor impregnants are also demonstrated.

**Morecambe Electrical Equipment Co., Ltd.,** Westgate Works, Morecambe.—**Stand S.10.**—Multi-motor control boards and various types of starting equipment and contactors, together with the latest development of unit type construction which can be readily assembled and extended by customers to meet changing factory requirements.

**Morphy-Richards, Ltd.,** 50, Conduit Street, London, W.1.—**Stand H.15.**—Apart from special demonstrations of the company's "Super-Suction" cleaner, rotary power ironer and new "Astral" spin dryer a wide range of domestic appliances is exhibited, including irons, toasters, heaters, door-chimes, refrigerators, etc.

**M.T.E. Control Gear, Ltd.,** Leigh-on-Sea, Essex.—**Stands K.21 & Y.10.**—The ground floor stand is devoted to the display of special multi-motor control panels for various industrial applications, and an interesting feature is the demonstration of the new "Discmag" electro-magnetic brake, which has been developed particularly for automation, machine tool and textile applications.

On the first floor stand the company is staging a demonstration of control panel assembly and manufacture.

**Mycalex & T.I.M., Ltd.,** Ashcroft Road, Cirencester, Glos.—**Stand G.14.**—The display covers Mycalex glass bonded mica insulation; "Mycalon," an insulator with greatly improved electrical and thermal qualities at high frequency; and "Micatherm," which is designed principally for arc shields and has been adapted for use with an embedded element as an electrical heater and is most suitable as a desiccator in electronic equipment.

A number of additions to the range of T.I.M. f.h.p. shaded pole motors are included and other new products are the Mycalex quick release terminal and the T.I.M. snap action appliance connector which utilises the quick release terminal.

**Nalder Bros. & Thompson, Ltd.,** Dalston Lane Works, London, E.8.—**Stand K.17.**—A wide range of instruments of various types is presented mounted on typical steel cubicles in various colour finishes. Other exhibits are protective relays for either instantaneous or time delay operation; an automatic safety device for the protection of operators of portable electric tools; a derivative relay; locking indicator; mean level indicator with quick setting device; maximum and minimum demand indicator; cold cathode relay; and miniature circuit-breakers in single, double and triple pole units. A practical demonstration illustrates the assembly of instrument components. New products include electrostatic voltmeters, from 500 V to 10 kV, self-contained a.c. and d.c., and contact making ammeters with contact rating electronically amplified for heavy duty.

**Nettle Accessories, Ltd.,** Harper Road, Wythenshawe, Manchester, 22.—**Stand E.5.**—Domestic and industrial accessories shown include 13 A ring main sockets and switch sockets, ceiling roses, e.s. and b.c. batten holders, lampholders, a.c. switches, architectural fittings, and inspection handlamps. Weatherproof rubber couplers for industrial use, available in rubber or neoprene, are included in a special display. Among new products shown are contemporary lampholders; "Find-a-Lite" switch unit; contemporary right-angle bracket with lampholder; 15 A to 13 A adaptor; watertight lampholder; spike-on lampholder moulded in rubber or neoprene; festoon lengths of striplight and e.s. striplight produced for Canada (manufactured by D.R. Illuminations, Ltd., an associate company); and fused 13 A four-pin rubberclad couplers.

**Newman Industries, Ltd.,** Yate, Bristol.—**Stand M.2.**—A comprehensive electric motor display includes f.h.p., drip-proof squirrel-cage and slip-ring, flameproof and explosion proof, and vertical hollow and solid shaft pump types. A new single-phase motor is designed to overcome the disadvantages of the capacitor-start-induction-run arrangement.

**Nife Batteries,** Redditch, Worcs.—**Stand J.22.**—Of special interest is a selection of Nife batteries for railway use, comprising a typical 110 V, 35 Ah battery for point machine operation, part of a track circuit battery in a transparent plastic case, and sections of 110 V batteries used for starting diesel-electric locomotives and for lighting and auxiliary circuits on electric trains. Typical Nife batteries with high performance and low resistance for electric starting, as well as examples of marine and traction batteries, are displayed. There is also a range of portable lamps and floodlight sets.

**Oliver Pell Control, Ltd.,** Cambridge Row, Woolwich, S.E.18.—**Stand U.8.**—The company shows a range of "custom-built" decimal motors, and there is a complete assembly line manufacturing the electrical mechanism that operates the "Ronson" electric shaver.

**Osborn Manufacturing Co., Ltd.,** 5–13, Highgate Square, Birmingham, 12.—**Stand T.21.**—In addition to the "Cobra" electric paint scraper the company is showing its new "Bairn" electric paint

stripper. A new range of lighting fittings is being displayed.

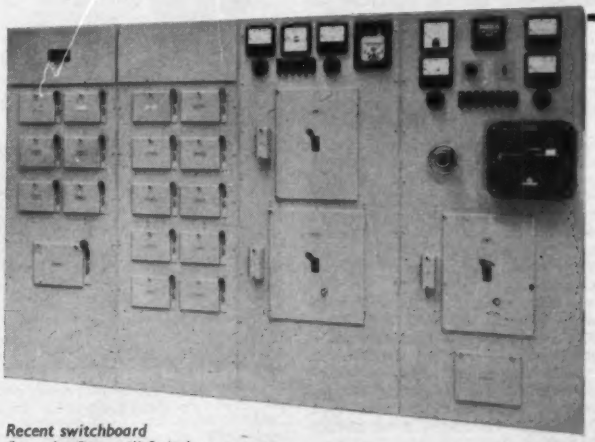
**Otter Controls, Ltd.,** Otters 'Ole, Market Street, Buxton.—**Stand T.20.**—Two new products are a "blanketstat" and blanket safety cut-out designed to give close temperature control, and the type H Mk. III (auto or manual reset) safety cut-out for fan unit heater and convector overheat protection. Other exhibits include snap action thermostats up to 20 A, 250 V a.c.; type T range of miniature thermostats which are extensively used for temperature control in radar equipment, guided missiles and aircraft; preset immersion heater thermostats; motor-guard for the temperature and current protection of single-phase electric motors; choke control thermostats; and automatic fuses and circuit-breakers for the motor car industry.

**Ottermill Switchgear, Ltd.,** 1, Victoria Street, London, S.W.1.—**Stand M.3.**—A seven-panel oil circuit-breaker board equipped with instruments (a section of a 16-panel board for delivery to the Sudan) is exhibited as well as an industrial board with incoming oil circuit-breaker and outgoing fuse switches. Two cubicle switchboards have a representative selection of fuse switches from the company's range of quick make, quick break, parallel motion, type tested switches. Examples of busbar trunking include lengths of 100, 250 and 600 A together with various accessories; and d.p. 100 A trunking fitted with sockets for use on low voltage systems. Rising main busbar systems of 100 A and 250 A with fire barriers and incoming units are on show.

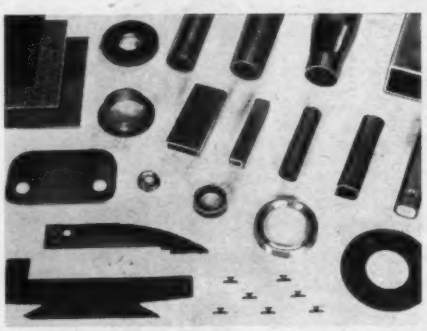
**"P. & B." Engineering Co., Ltd.,** Crompton Way, Crawley, Sussex.—**Stand T.28.**—A representative range of P & B Golds relays for motor protection is being shown, including one mounted in an English Electric draw-out case. Special thermal relays, including the stalling relay, thermal load indicators, in a variety of styles, thermal maximum demand indicators in cases designed for use in consumers' premises, a maximum and minimum voltmeter and a selection of "Easifix" split core current transformers are also shown. Earthing clamps for use in maintenance work on lines and in substations include special designs to the specification of the C.E.G.B. and Electricity Boards. There are two new designs of live line taps which are being increasingly used on rural systems.

**Panelec (Great Britain), Ltd.,** 21, Bloomsbury Street, London, W.C.1.—**Stand T.18.**—A prominent feature is a model of a floor warming system. This clearly demonstrates the cable housing sections, embedded in the floor screed, and the spring clips which attach the metal heat diffuser to them. Removable covers give access to the cables without disturbing the floor in any way. The cable housings are specially designed to transmit heat quickly to the expanded metal heat diffuser and floor surface. The "Panelec" floor heating system is also used in a modified form for anti-floor-heave mats in cold stores.

**Parmeko, Ltd.,** Percy Road, Leicester.—**Stand R.1.**—Examples of recently developed magnetic amplifier equipments for specific applications include a d.c. voltage regulator for providing stabilised supplies for computers, laboratories, measuring instruments, etc.; an airfield lighting circuit regulator for controlling



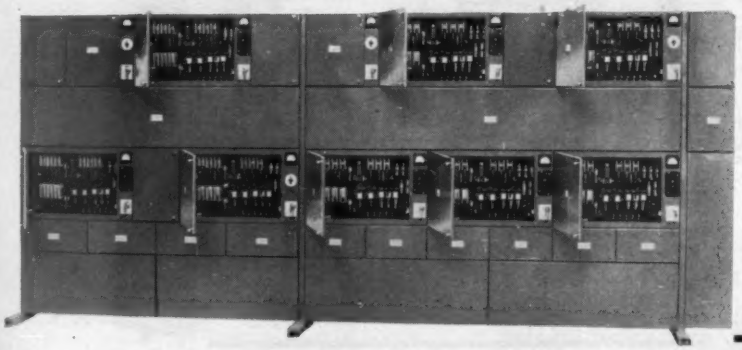
*Recent switchboard from the Ottermill Switchgear range*



*A selection from the range of electrical insulating materials manufactured by Micanite & Insulators Co., Ltd.*

*A Nalder Bros. 4in circular scale instrument with sword type pointer and platform scale*

*Morecambe unit type construction multi-motor control board*



*One of the new range of Osborn lighting fittings, the T345/227 table lamp in black wrought iron*

the brilliancy of airfield runway approach lights and incorporating earth fault and remote indication facilities; a photo-cell magnetic amplifier for a variety of applications such as oil burner flame failure control, burglar alarms, etc.; and variable speed motor control equipment and automatic alternator voltage regulators. Among the transformers shown is a new design of low voltage unit for factory and machine tool applications and a special safety transformer for the operation at reduced voltage of portable tools, drills, sanders, polishers, etc.

**Parmiter, Hope & Sugden, Ltd,** Fluvent Electrical Works, Longsight, Manchester, 12. — **Stand A.1.** — New developments include a range of flame-proof combined switches and fuses assembled in unit switchboard form. The cabinet style distribution boards can now be supplied with isolating switches of similar exterior design, and these boards are also shown in a design for semi-flush mounting. Further exhibits, under the trade names "Aeroflex" and "Fluvent," cover flush fronted cubicle type switchboards (with oil circuit-breakers), unit type switchboards with the latest "Fluvent" heavy duty fuse-switches, power pillars and special duty distribution pillars, ironclad distribution boards with incoming isolators, fuse-switches, distributor units, house service and street lighting fuses and the type AD/FC range of "Aeroflex" h.b.c. energy limiting class P fuse links.

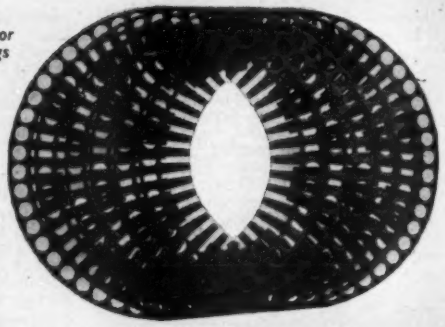
**Partridge, Wilson & Co., Ltd.,** Davenset Electrical Works, Leicester.—**Stand K.3.**—Rectifier sets, transformers and battery chargers are the three main groups exhibited on this stand. There are examples of automatically controlled circuits in each group. For example, a constant voltage electroplating rectifier is being shown for the first time and there are also several battery chargers with constant output voltages as well as some constant voltage transformers. Items of special interest are the "Davenset" earth core testing set for testing electric hand tools, a range of inexpensive low voltage safety transformers and an h.v. insulation flash tester.

**Permali, Ltd.,** Bristol Road, Gloucester. —**Stand J.18.**—"Twenty-one years of service to the electrical industry" is the theme of the company's stand. Diagrams show the part played by densified wood and glass fibre laminates in the construction of ZETA. The centrepiece is a 14ft high e.h.v. busbar support structure made entirely of Permali. Other exhibits include arc control pots for oil-immersed switchgear; lift rods and guides; stator winding bracing parts and packings; transformer metallised surge rings and clamping rings; off-load and on-load tap changer components; "Permaglass" glass fibre reinforced tubes, etc.; "Dialem" laminated paper and fabric tubes; and indoor and outdoor switchgear and transformer bushings for voltages up to 88 kV.

**Permanoid, Ltd.,** New Islington, Manchester, 4.—**Stand M.16.**—All types of plastic cables, wire and insulating sleevings, including communication cables for the radio, television, telephone and electronic industries are displayed. Of particular interest is a range of silicone/glass and silicone/"Terylene" sleevings.

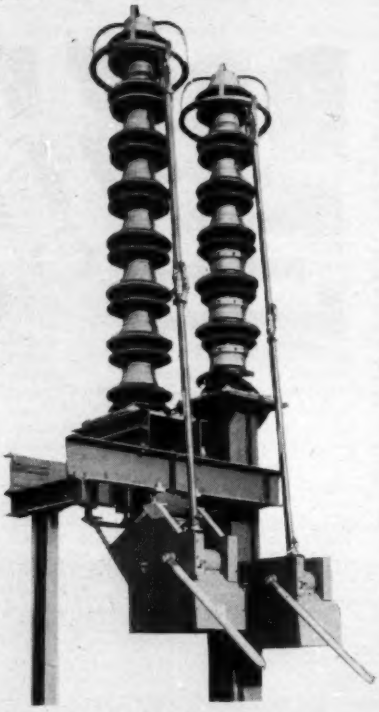
**Philips Electrical, Ltd.,** Century House, Shaftesbury Avenue, London, W.C.2.—**Stand K.14.**—A new type of ballast with a "Polyester" resin filling is introduced. The use of this material has resulted in considerable reduction of

*Permali turbo-alternator end winding comb rings*



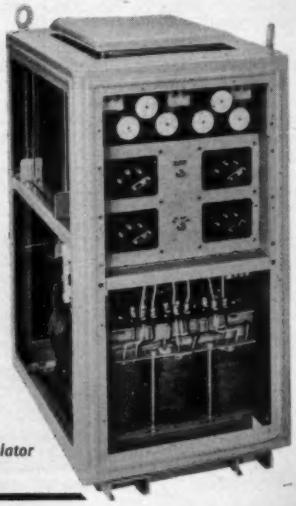
*"Roto-Iron" automatic rotary electric ironer (Revo Electric Co., Ltd.)*

*Plessey hermetically sealed "C" core transformer*



*Power Connectors earthing device developed for use in 275 kV substations*

*Parmiter, Hope & Sugden cabinet style distribution board for semi-flush mounting*



*Parmeko d.c. voltage regulator*

choke size. Initially the ballast will be available only in 40 and 80 W switch-start versions. The range of mercury fluorescent lamps, in isothermal bulbs, is extended to cover 80, 125 and 1,000 W. A screwdriver type voltage indicator for 110–380 V a.c./d.c. is of a robust plastics material. A 32 W circular fluorescent lamp for architectural applications is being shown for the first time, and there will be entirely new midget colour glow indicator lamps for mains voltage use.

Additions to the tungsten range include smaller bulb 150 and 300 W g.l.s. lamps and a 375 W reflector lamp for high mounting in industrial situations. An improved process of colouring has been employed in the manufacture of decorative lamps by which the lamps are internally colour-coated. Several new lighting fittings are also introduced.

**Pirelli-General Cable Works, Ltd.,** 343–345, Euston Road, London, N.W.1.—**Stand V.2.**—A wide range of cables and accessories and a working model illustrate the activities of the company in the fields of power cable manufacture, telecommunications, overhead line erection and overhead railway electrification.

**Plessey Co., Ltd.,** Ilford, Essex.—**Stand S.9.**—This display includes a comprehensive range of electronic components for use in military and civil equipment, and in industrial electronic and electrical apparatus. These include transformers for machine tool control and for use in electronic computers, a selection of miniature and small mains transformers, a range of hermetically sealed "C" core transformers, relay coils, and toroidal windings. In addition, encapsulated components, filter units for Service electronic equipment, and vibrators and relays are shown, as well as a number of synchros and servo components; a wide range of plugs and sockets and connectors; and a variety of cold moulded insulators.

**Poles, Ltd.,** Tyburn Road, Erdington, Birmingham.—**Stand S.5.**—Miniature models illustrate the large variety of work undertaken in the electrical engineering industry. A speciality is the "Adastra" sectional steel pole. The models displayed include h.v. transmission line, l.v. distribution line, telecommunications and 60ft floodlight poles, a 78ft radio mast (guyed type), and street lighting columns.

**Porter Electrical Products, Ltd.,** 2, North Park Road, Harrogate.—**Stand D.10.**—Since its introduction a few years ago, the "Portaway" earth-continuity and bonding system has become quite extensive and detailed in character. In addition to the earthing conductors, of which there are now five sizes, ranging from 0·015 sq in to 0·15 sq in, there is a range of "Fulgrip" bonding clamps. Two new introductions are clamps for making neat right-angle bends and for bonding conductors cross-wise. The "Portaway Dyrod" earth electrode is now made in lengths up to 12ft long with both ¾ and 1in faces.

**Power Centre Co., Ltd.,** Lloyd Street, Wednesbury, Staffs.—**Stand K.12.**—Cable trunking is exhibited in surface, flush, floor and underfloor patterns with and without internal fillets. Busbar trunking is available for both general and final distribution, and either fixed or plug-in type fuse boxes can be supplied. Of particular interest is the miniature pattern busbar trunking incorporating all-insulated busbars and tap-off points at 2ft centres. A new product, trunking for fluorescent lighting applications, embodies several novel features.

**Power Connectors, Ltd.,** 2, Caxton Street, Westminster, London, S.W.1.—**Stand E.12.**—As specialist designers, consultants and manufacturers of connecting and terminating equipment for electrical power installations, the company displays many examples of fittings approved and used as standard by Electricity Boards and switchgear manufacturers. An earthing device developed for the C.E.G.B. for use in 275 kV substations is shown by the special h.v. switchgear department.

**Process Control Gear, Ltd.,** Lattimore Road, St. Albans, Herts.—**Stand X.5.**—The "Proscon" type SK thermostat which the company is exhibiting is designed primarily for the temperature control of convectors but with modifications to component parts can be used for other applications.

**Pyrotenax, Ltd.,** 7, Victoria Street, London, S.W.1.—**Stand J.16.**—Mineral insulated cables for lighting purposes and heavy duty applications to large motors; cables for three-phase and single-phase rising mains and laterals for blocks of flats; pre-assembled cable units; m.i.c.c. cables for earthed concentric wiring; thermo-electric cables, thermocouples and compensating cables, heating cables for radiant heating of buildings, pipe line tracing, de-icing, etc.; and cables for feeds to street bollards, beacons, directional signs and public lighting.

**Ranton & Co., Ltd.,** "Rock" Works, Commerce Road, Brentford, Middlesex.—**Stand C.5.**—"Rock" electrical accessories.

**Rawlplug Co., Ltd.,** Rawlplug House, Cromwell Road, London, S.W.7.—**Stand M.4.**—A new electric drilling machine, the "Vibroto," has been designed to combine an intense rate of vibratory action with fast rotary movement for the drilling of holes in concrete, granite, stone, etc.

**Record Electrical Co., Ltd.,** Cirscale Works, Broadheath, Altrincham, Ches.—**Stand B.9.**—The major portion of the stand is given over to "Cirscale" instruments. Contemporary styling is well to the fore and this year some attention has been paid to the larger sizes. Besides redesigned 12 and 16in dial instruments an additional size, 10in, makes its first appearance. An interesting exhibit is an internally illuminated model of a "Cirscale" moving coil indicator in which the movement can be clearly seen. A full range of switchboard instruments is displayed. New products include a portable instrument of the "Cirscale" type of attractive appearance. Another new idea is an "edge-lit" dial specially designed for traction service. Series A "Cirscale" instruments are now available hermetically sealed when required without increase in dimensions.

**Remploy, Ltd.,** 25–28, Buckingham Gate, London, S.W.1.—**Stand R.6.**—Soldering irons (25 to 125 W); immersion heaters; oil-filled radiators (½, ¾ and 1 kW); greenhouse heaters; and tubular heating elements.

**Revo Electric Co., Ltd.,** Tipton, Staffs.—**Stand H.9.**—In addition to a selection of street lighting lanterns for sodium, mercury, tungsten and fluorescent lamps, a new installation is displayed for the illumination of street signs in accordance with the latest M.O.T. regulations. The industrial lighting display includes a range of fluorescent ceiling fittings which comprises one basic unit, with interchangeable covers or reflectors suitable for domestic, commercial or industrial use. In the switchgear display are selections from the "Silvertip" range, which now includes 30 and 60 A models, and the versatile "Safeway" distribution fuse board. The newly designed "Ariel" ceiling fan, lately restyled, is shown.

On show for the first time is the new "Roto-Iron" automatic rotary electric ironer. The ironer, which is portable, is thermostatically controlled and can be set to temperatures to suit various kinds of fabrics. The ironing shoe provides 84 sq in of ironing surface. The "Revomatic," "Regal" and "Regent" cookers are also displayed and these can now all be fitted with timer-control and glass door.

A representative selection of electric fires and convector heaters are presented in full colour range and other domestic items include the recently introduced "Handy" clothes dryer; the "Automatic" electric iron; electric kettles; and the "Mayfair" plate warmer. Finally, in the electronic field, the company offers an electronic timer, a precision tachometer and electronic counters.

**A. Reyrolle & Co., Ltd.,** Hebburn, Co. Durham.—**Stand M.6.**—Two 6·6 kV horizontal draw-out air-break circuit-breakers, one of 250 MVA breaking capacity and the other of 500 MVA rating, are being shown. The enclosures of both are of the cubicle type with separate compartments for the busbars, the current transformers, the voltage transformer (when fitted), and the withdrawable circuit-breaker. The circuit-breakers, which are solenoid-operated, are mounted on their own carriages, and an integral earthing feature enables them to be plugged into normal circuit, feeder-earth, or busbar-earth positions. Selection to these positions is obtained on the 500 MVA unit by rotatable cranked plug isolating contacts, and on the 250 MVA unit by hinged plug isolating contacts. Epoxy-resin insulation is used extensively in both panels. Hinged doors on the cubicles are closed when the circuit-breakers are racked in, presenting a pleasing clean appearance practically free of projections.

The company is also showing a typical medium voltage switch-and-fuse distribution board incorporating newly designed q.m. & b. switch units, and some examples of interlocked switch and plug units.

**Rheostatic Co., Ltd.,** Slough, Bucks.—**Stand E.4.**—A display of Satchwell "Superswitches" shows the various types of controls which are now available for infinite regulation of heat input to boiling plates and similar heating apparatus. Each instrument is calibrated at the works and no site setting or adjustment is necessary during its life, a point which is borne out by the provision of an indexed "low" position. The latest developments in Satchwell automatic controls are also represented. Among these new controls is the TL room thermostat. Attractive design is combined with sensitive control characteristics and a Satchwell enclosed micro-gap switch mechanism. A built-in thermometer matching the thermostat scale is provided.

**D. Robinson & Co.,** 58, Oaks Avenue, Worcester Park, Surrey.—**Stand S.13.**—On this stand are being shown a new miniature version of the "C. & S." plug-in relay system; plug-in mercury relays; and the "J" relay. The last-named, a completely new development designed for ease of fixing and wiring, measures only 1in by 3in by 2¼in and is

fitted with three change-over contacts rated at 3 A at 500 V a.c.

**Rodene Electrical Co., Ltd.,** Spring Grove Works, 579, London Road, Isleworth, Middlesex.—**Stand S.13.**—In conjunction with its distributors, D. Robinson & Co., the company is exhibiting synchronous timers and related components, including a completely new model which is a clock-faced and flush mounting unit; "25 Series" auto-reset timers; multi-cam timers; the Rodene synchronous motor, the instant-start and self-clutching features of which will be demonstrated; and a.c. and d.c. operated stepping relays.

**Rolco Engineering, Ltd.,** 407, Hornsey Road, London, N.19.—**Stand V.5.**—Fractional h.p. shaded pole motors; mains convertors for battery receivers; home battery chargers; and plastic moulding for the electrical and radio industry.

**Ross, Courtney & Co., Ltd.,** Ashbrook Road, Upper Holloway, London, N.19.—**Stand F.3.**—Wire end terminals; solder tags; terminal tags suitable for crimping; crimping tools and tools for closing wire end terminals; pillar terminals; cable sockets; h.v. terminals; cable connectors; m.o.s. sockets, etc.

**Rowlands Electrical Accessories, Ltd.,** 157–8, Hockley Hill, Birmingham, 18.—**Stand F.4.**—Industrial and commercial lighting fittings include the range of R.E.A.L. flood-lanterns for use with tungsten, mercury and sodium vapour lamps, together with redesigned "Realux" overhead mounting floodlights. Non-corrodible watertight fittings in all sizes with and without reflectors include a number of new high wattage models. Heavy duty porcelain lampholders, porcelain brackets, workshop and local lighting brackets, handlamps, and accessories are also shown.

**Sams Electrical (London), Ltd.,** Africa House, Kingsway, London, W.C.2.—**Stand Q.9.**—Electrical accessories and replacement elements for domestic appliances.

**Wm. Sanders & Co. (Wednesbury), Ltd.,** Falcon Electrical Works, Wednesbury.—**Stand J.2.**—Cubicle and unit type switchboards; "Sandaclad" h.r.c. fuse switches; "Sandasteel" and "Sandalita" fuseboards; consumers' units; cooker control units; electric wiring accessories, unbreakable rubber plugs; h.r.c. cartridge fuse links; and busbar chambers. The "Sandaline" fuseboard has been extended to 30, 60, 100 and 200 A sizes and exhibited for the first time is a new 10 A, 500 V t.p. isolating switchfuse, designed for controlling small motors, etc., not exceeding 5 h.p.

**Sangamo Weston, Ltd.,** Great Cambridge Road, Enfield, Middlesex.—**Stand A.2.**—Electricity meters and metering accessories include the latest developments in single-phase and polyphase watthour meters. Of the range of "Sangamo" time switches, 18 different models are shown. Among "Weston" measuring instruments shown are laboratory standards, portable, switchboard and panel instruments. Other exhibits include standard cells, photo-electric cells, millivolt amplifiers, photographic exposure meters, instrument switches, moving coil relays, tachometers, thermometer bulbs and a newly introduced ice warning system for aircraft.

**Joseph Sankey & Sons, Ltd.,** Bankfield Works, Bilston, Staffs.—**Stand J.10.**—A new form of inter-laminar insulation, "D.R.N.S.", whilst retaining the insulation properties of "Insuline," has the added advantage of remaining unimpaired at re-annealing temperatures. Another development of particular interest is a recently introduced form of ductile electrical steel known as Stalloy 92 and 86 (Ductile) for use in the manufacture of laminations.

**Santon, Ltd.,** Somerton Works, Newport, Mon.—**Stand M.11.**—An improved "Monmouth" thermal storage water heater incorporates horizontal heating units (3 kW top, 3 kW bottom) with fully adjustable thermostats. Two capacities are available, 12 and 20 gal. The new design of rectangular wall mounting cistern type heater is now available in capacities of 5, 7½ and 12 gal. They are fully automatic and 12 and 20 gal sizes will be available in April.

**George H. Scholes & Co., Ltd.,** Wylex Works, Wythenshawe, Manchester, 22.—**Stand E.9.**—"Wylex" small switch and fusegear includes switch fuse control units, all-insulated and metalclad with rewirable and cartridge fuses, assembled in any number of fuses up to eight-way; also the "Extenso" system for extensions to existing fuse unit installations. Other exhibits are "Wylex" and "Sonex" cooker control units; 30 and 60 A d.c./a.c. switches; 20 A t.p. 500 V isolator; and "Wylex" glands. Among accessories are the "Wylex" dual plug system for ring main and non-ring main; 20 A d.c./a.c. switches with and without pilot light; and clock connectors. New products include a metalclad "Sonex" cooker unit; pattresses for use with 20 A switches; and switch fuse control units for domestic installations incorporating off-peak tariff floor heating and water heating.

**Scottish Cables, Ltd.,** Deanside, Renfrew.—**Stand D.2.**—P.i. cables up to 33 kV; p.i. aluminium conductor cables up to 11 kV; mass-impregnated non-draining cables; r.i. cables for distribution and mining purposes; and a wide range of plastic types including multi-core cables for communications.

**Siemens Edison Swan, Ltd.,** 155, Charing Cross Road, London, W.C.2.—**Stand G.8.**—The "Kuwait" twin street lighting lantern and a "Congress" interior fitting are shown together with a series of contemporary general service lamp fittings and a complete selection of general service lamps, motor car bulbs, and discharge lamps for all purposes. There is also a representative selection from the wide colour range of the new Siemens Ediswan centenary "Neophone," the first printed circuit telephone.

Exhibits from the Electronic Control and Indication Division are all new and consist of a miniature high-speed indicator; a remote control and supervisory system; a nylon chain; and an advertising unit. Photographs and samples of power, telephone, rubber and plastic cables, together with photographs of installation work, are exhibited. The germanium rectifier on show is a comparatively new application of semiconductors which have previously been used as transistors for radio and television.

Other exhibits include rectifying equipment; "Ensur-a-Lite" emergency lighting equipment; a complete range of earth leakage circuit-breakers; and a representative range of electrical accessories.

**Siemens-Schuckert (Great Britain), Ltd.,** Faraday Works, Great West Road, Brentford, Middlesex.—**Stand N.10.**—S.14 plug-in miniature circuit-breakers for current loadings up to 30 A can be seen enclosed in various sizes of distribution boxes. An exhibit from the heavy industrial range includes a typical I.D.S. board embodying differential earth leakage protection. Various types of flameproof equipment for Group II gases are shown including push-buttons, annunciators, limit switches, indicators, etc., and larger units such as the B.S.A.12 section switch provided with earth leakage protection. A new range of sheet steel multi-panel control boards is also on show and welding equipment includes a miniature spot welder, type WPO.5, which is suitable for welding valve filaments; and a 20 kVA air operated pedestal spot welder, type WPA.4.

**Simplex Electric Co., Ltd.,** Broadwell, Oldbury, Birmingham.—**Stand J.13.**—The company commemorates its 60th year of conduit and conduit fittings manufacture with a special display, together with a representative range of other products. In the lighting section prominence is given to the "A.C.F." (anti-corrosive fluorescent) range of fittings. In addition there are screwglass 60 and 100 W fittings; blended light fittings designed for high-bay installations; "Corrilux" and "Prismax" weatherproof and dust-tight bulkhead fittings; and a range of floodlight fittings.

Representative items of the "Regent" range of switchgear are shown, as well as "Monarch" fused switches made up in the form of a switchboard. In the company's flameproof range single and twin fluorescent lighting fittings are shown in addition to two standardised general purpose flameproof enclosures (Buxton certified for groups II and III) for a variety of electronic controls, meters, push-buttons, and indicator lights. An example of the layout of Simplex underfloor duct and components is included and there is a representative display of ironclad switch assemblies, switch sockets and domestic switches. The "Merplex" floor warming system, shown for the first time, consists of five rated element lengths, each designed to fit into a normal section of concrete. In addition there is a multi-way junction box which takes up to 12 kW.

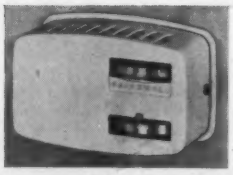
"Creda" domestic appliances include the "Stargazer" and "Carefree" cookers and the "Super Comet" luxury cooker. Also prominently displayed are the "Debonair" spin dryer; water heaters, including the "Crusader" 3 gal model fitted with an automatic flow restrictor; and a range of space heating appliances including the new 2 kW "Calypso" convector.

**Slough Metals, Ltd.,** Oxford Avenue, Slough, Bucks.—**Stand H.20.**—Among new products are a portable arc-welder; floor traps and lids; street lighting fittings; and precision sand castings by a new process.

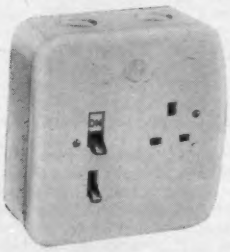
**S.L.R. Electric, Ltd.,** Welbeck Road, South Harrow, Middlesex.—**Stand S.18.**—The latest designs of lighting fittings are shown, including opal ceiling and satin opal glass pendant fittings. A 50ft 80 W fluorescent trough reflector fitting with a new design of simple fixing louvre is also on view as well as an opal "Perspex" diffuser module unit. It is designed for 24 in/sq ceiling panels and allows for side illumination of the ceiling.

**Small Electric Motors, Ltd.,** Eagle Works, Churchfields Road, Beckenham, Kent.—**Stand K.19.**—Among a wide range of motor exhibits are single-, three-phase and d.c. machines, including drip-proof, screen-protected and T.E.F.C. types up to 10 h.p., all C.S.A. approved. Other exhibits include high-speed universal

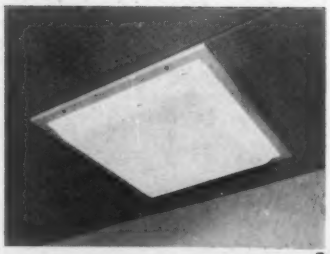
Reyrolle 6·6 kV 250 MVA horizontal draw-out air break circuit-breaker



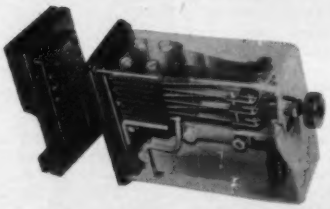
Rheostatic "Satchwell" type TL room thermostat



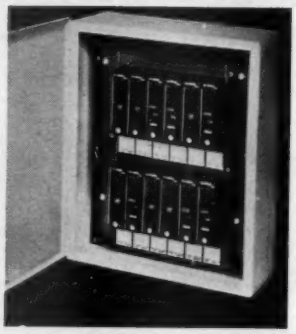
Metalclad "Sonex" cooker control unit (Geo. H. Scholes)



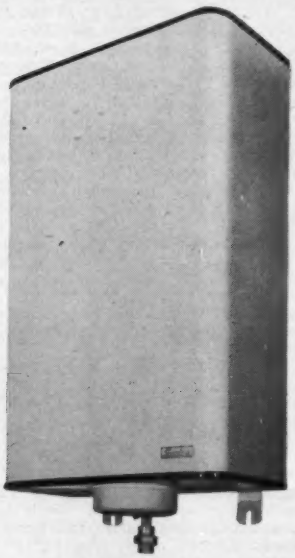
S.L.R. opal "Perspex" diffuser module unit



Robinson plug-in multi-contact relay with transparent cover



Siemens-Schuckert 12-way distribution box



Santon wall-mounting cistern type water heater

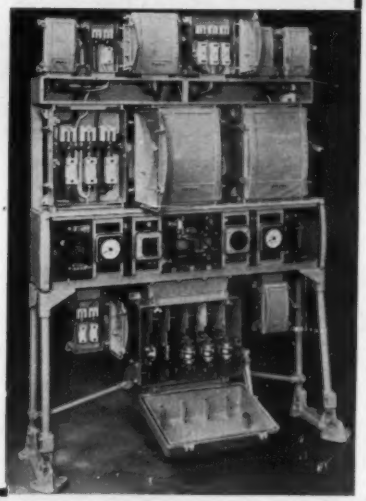
Sanders "Sandamo" 10 A 500 V isolating switchfuse

An example of Simplex switchboard construction incorporating "Regent" and "Monarch" gear with instruments

Rodene type 7000 auto-reset timer

Smiths "Dorking" "Sectric" wall clock

Smiths Industrial Instruments calibrated relay unit with hermetically sealed cover



motors; a demonstration unit which encloses the switch mechanisms on single-phase motors, enabling ventilated types to be used in many applications where T.E.F.C. motors have been specified; battery-operated motors up to 10 h.p., with control gear; alternators up to 6 kVA single- and three-phase; and rotating equipment; as well as special equipment, including water pumps, incorporating built-in motors.

**Smith Hobson, Ltd.,** Hersham Trading Estate, Walton, Surrey.—**Stand Q.10.**—High precision current and voltage transformers for laboratories and testing rooms from 660 V to 33 kV and from 5 to 4,000 A are the main features of this display. A new electronically compensated current transformer is shown.

**Smith Meters, Ltd.,** Rowan Road, Streatham Vale, London, S.W.16.—**Stand Q.7.**—Single-phase credit and prepayment meters; polyphase meters of all sizes, with and without maximum demand indicators; meter test sets; and the "Sincos" kVA meter, designed to register kVA irrespective of p.f. Details are available of a relay test set and a type of phase-shifting transformer designed for obtaining loads at any desired p.f.

**Herman Smith Smithlite, Ltd.,** Empire Works, Dudley, Worcs.—**Stand T.9.**—A range of lighting fittings utilising the "Smithlite" centre-contact lamp is displayed in addition to the company's standard range of fittings for commercial and industrial application. For the first time busbar trunking, busbar chambers, plug-in boxes, cable tap arrangements and distribution boards are shown.

**Smiths Clocks & Watches, Ltd.,** Waterloo Road, Cricklewood, London, N.W.9.—**Stand L.8.**—"Sectric" clocks for the home and commercial use; and time switches for cookers, washing machines, and other domestic appliances.

**Smiths Industrial Instruments, Ltd.,** North Circular Road, N.W.2.—**Stand L.8.**—A transistor batch counter that has a maximum counting rate of 1,000 per second and can batch at 300/min with automatic reset on completion of the batch is on view. Also exhibited is a calibrated relay, which operates within very close tolerances at a predetermined voltage or current. Typical applications for the relay are engine starter and overspeed protection, overspeed warning, close differential apparatus and machine tool overload protection.

**South Wales Switchgear, Ltd.,** Blackwood, Mon.—**Stand J.8.**—Items from the company's range of 11 kV compound and air insulated indoor metalclad switchgear in capacities up to 500 MVA, 2,000 A, are displayed. Other exhibits are two types of 440 V, 800 A switch fusegear; a 33 kV outdoor air insulated metalclad package type switch unit in model form; and typical power transformers for substation or industrial use from a wide variety manufactured in capacities up to 2,500 kVA at 66 kV.

**Southern Areas Electric Corporation, Ltd.,** 28, Queen Anne's Gate, Westminster, London, S.W.1.—**Stand F.3.**—Three of the companies in the group, New Day Electric (Sales), Ltd., P.A.M., Ltd., and Ross Courtney & Co., Ltd., display products on this stand.

New Day Electric show for the first time the 1 kW "Westbury" lightweight portable space heater with mineral filled black heat elements. Another heater is the "Newday," fitted with a chronomatic control device by which the user can pre-set the heater to come into operation at a given time. Immersion heaters and a full range of matched accessories, including multi-gang switches, are shown.

P.A.M., Ltd., exhibits a battery-operated transistorised counter designed for counting small production quantities at a maximum rate of four per second. It is claimed to be the only battery operated counter of its type on the market. There are also a high speed mains/battery transistorised counter; a surge recording voltmeter; a sub-standard frequency generator; a 50 c/s electronic synchroscope; and "Tem-Con" temperature and humidity controllers.

**Square D, Ltd.,** 100, Aldersgate Street, London, E.C.1.—**Stand S.4.**—Products exhibited include relays; magnetic contactors; magnetic starters; combination starters; automatic star-delta starters; reduced voltage starters; control panels; control centres; remote control stations; limit switches; pressure switches; pneumatic timing relays; voltage testers; thermal overload relays; fibre duct; and replacement and modification kits. New products in this range include class 7001 d.c. magnetic relays; class 8538 combination starters incorporating load-break disconnect switches that ensure maximum operational safety; class 8998 control centres; class 9050 timers of narrow base design and the class 9001 push-to-test pilot light.

**Standard Telephones & Cables, Ltd.,** Connaught House, 63, Aldwych, London, W.C.2.—**Stand F.6.**—On show is one of the silicon rectifier cubicles from a 130 V, 20,000 A d.c. power plant. The installation has been designed for the electro-chemical extraction of metals from ores and the complete plant includes an e.h.v. circuit-breaker, regulator, rectifier supply transformers with reactors, rectifier cubicles and a control cubicle. Also on display are stock ranges of transformer/rectifier equipment; h.v. cable fault locators; p.f. correction capacitors and power cables; telephone cables; an acoustic mill feed controller; electronic valves; a transistor test set; and magnetic materials.

**J. G. Statter & Co., Ltd.,** 82, Victoria Street, Westminster, London, S.W.1.—**Stand L.26.**—H.v. metalclad drop-down draw-out oil circuit-breaker equipments, ASTA tested and certified up to 350 MVA, 11 kV, suitable for both indoor or outdoor installation, are exhibited in addition to the company's Type "VL" metalclad automatic oil fuse switch units with associated fault making load breaking non-automatic oil switch units for use on systems up to 250 MVA rupturing capacity at 13·2 kV.

L.v. switchgear includes h.r.c. air circuit-breakers in both fixed and draw-out forms having interrupting ratings up to 31 MVA, 415 V, and in sizes up to and including 2,000 A. Knife switches, isolating switches, current transformers, instrument selector switches and multi-way terminal boards are also displayed.

**Sterling Cable Co., Ltd.,** Aldermaston, Berks.—**Stand U.2.**—New products include specially protected cables and non-metallic jointing devices for corrosion areas.

**Stone-Chance, Ltd.,** Crawley, Sussex.—**Stand R.3.**—Marine lighting equipment; fog detector unit; selection of electric submersible pumps; rotary switches; marginal relays; automatic electronic synchroniser; automatic control cubicle; zenithal unit with lamp-changer; and a gimbal mounted pendular apparatus for a light vessel.

**Stream-Line Filters, Ltd.,** Ingate Place, London, S.W.8.—**Stand T.11.**—Filters for the purification and dehydration of insulating oil used in transformers and switchgear are shown. In addition to standard units the company displays filters for the purification of special insulating and impregnating compounds which can be supplied suitable for operating under conditions of high vacuum when necessary.

**Strong Electric Corporation (Great Britain), Ltd.,** Whyteleafe, Surrey.—**Stand S.21.**—In this display of fluorescent fittings particular emphasis is placed on the "Anticor" anti-corrosive range; the "Pressura" vapour-proof units; and the "Anglite" angled units for illuminating school blackboards or shop windows.

**Sunvic Controls, Ltd.,** No. 1 Factory, Eastern Industrial Estate, Harlow, Essex.—**Stand F.5.**—Various types of "Simmerstats" include the type "TYX," which has the additional advantages of two-way rotation of the control knob with definite "dwells" in the "on" and "off" positions. There is also a demonstration of the type "TQB" bi-metallic water-heater thermostat. Thermostats for other domestic appliances include types TA.1 for convector heaters; T.O. flexible drive oven thermostats; and TQA water heater thermostats.

**Switchgear & Cowans, Ltd.,** Elsinore Road, Old Trafford, Manchester, 16.—**Stand S.19.**—Switchgear exhibits include a type UB4 indoor air-insulated oil circuit-breaker equipment for use on systems up to 11 kV; a type L2/L3 660 V indoor air-insulated, horizontally withdrawable air circuit-breaker equipment arranged in double-tier formation; a type L2W 660 V triple-pole, wall-mounting type air circuit-breaker; a type MRS 650 V mining type flameproof section unit; a type A4 11 kV indoor air-insulated ring main equipment comprising two oil switches and one circuit-breaker with spring assisted closing and opening; and a type FA71/ID 11 kV indoor compound-filled ring main equipment comprising two oil switches and one circuit-breaker with spring closing and opening.

**H. D. Symons & Co., Ltd.,** Park Works, Kingston Hill, Surrey.—**Stand H.5.**—Flexible electrical insulation for all temperature classes. Combination slot insulations include the new Class "E" materials, "Melinex" and alternatively, "Triacetate," bonded to pressboard. Among Class "H" silicone elastomer products are coated and impregnated glass fabrics, as well as extruded sleeving. A new development is "Polyurethane" varnished glass, suitable for operation at a Class "F" temperature of 155 deg C.

**Synchronome Co., Ltd.,** Abbey Electric Clock Works, Woodside Place, Alperton, Middlesex.—**Stand L.5.**—Master clocks; electrical wall clocks; time recorders; special timing and control apparatus; fire alarms; and fire detection apparatus.

**Synthetic Carbon & Engineering Co., Ltd.,** Cumberland Road, Stanmore, Middlesex.—**Stand G.1.**—The display includes carbon brushes of all kinds, shapes, grades and fittings; brush holders for use on the largest or smallest commutators and sliprings, and examples of traction brush gear. Controller and contact parts include examples of controller fingers, relay assemblies, silver and sintered metal faced contacts and a very wide range of contact tips, while maintenance articles include spring balances for measuring

brush pressures, fibre glass commutator cleaning brushes, bedding stones, etc.

**Tate Engineers, Ltd.,** Portslade, Sussex.—**Stand R1.A.**—As specialists in overhead line jointing equipment and accessories this company exhibits a new type of compression line tap; compression joints for overhead power lines, including all types of bi-metal joints; jointing compressors and the fully automatic "Autopressor."

**Taylor Electrical Instruments, Ltd.,** 419–424, Montrose Avenue, Slough, Bucks.—**Stand S.17.**—A newly designed range of centre pole meters have a torque to weight ratio twice that of conventional moving coil meters with the result that they are claimed to operate entirely stick-free both in the horizontal and vertical positions. A new model 122 A pocket size multi-range universal meter is a 5,000 o.p.v., a.c./d.c. instrument with a total of 21 ranges up to 1,500 V, a.c. and d.c., and 15 A d.c.

**George E. Taylor & Co. (London), Ltd.,** 34, Southwark Bridge Road, London, S.E.1.—**Stand K.6.**—The installation of lighting, power, control cables, bells, telephones, radar, lightning conductors, etc., is typical of the work undertaken by this company.

**Taylor Tunnicliff (Refractories), Ltd.,** Albion Works, Longton, Stoke-on-Trent. — **Stand R.12.** — Refractory materials for electrical heating appliances of all types, and low loss ceramics as used on h.f. electronic appliances, etc.

**Telcon-Magnetic Cores, Ltd.,** Chapelhall Factory Estate, Chapelhall, Lanarkshire.—**Stand J.11.**—The exhibit emphasises the progress which the company has made in the field of strip wound cores for power distribution transformers. "C" and "E" type and toroidal cores are shown.

**Telegraph Construction & Maintenance Co., Ltd.,** Mercury House, Theobald's Road, London, W.C.1.—**Stand J.11.**—The Cables Division shows polythene insulated h.v. power cables. These include a 100 kV d.c. single-core submarine type which has been operating under service conditions for twelve months. P.i. cables for voltages up to 33 kV are also on display as well as a comprehensive range of plastic insulated wiring cables and p.v.c. insulated armoured cables for 250 and 660 V, with terminating glands and protective sleeves.

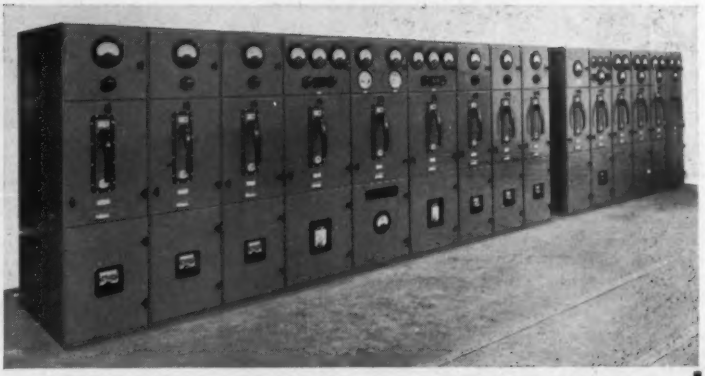
The Metals Division is exhibiting magnetic materials, "Mumetal," "Supermumetal," "Radiometal," H.C.R. alloy; "Permendur" and "Vicalloy" in various forms.

**V. Tessier, Ltd.,** 395, Staines Road, Hounslow, Middlesex.—**Stand Q.8.**—Formers for moving coil instruments and a selection of instrument dials.

**Tetra Engineering Co., Ltd.,** 1–3, Redhill Street, London, N.W.1.—**Stand K.5.**—Mineral embedded tubular sheathed elements for use in water, chemical and oil immersion, domestic cooking and heating, refrigeration and infra-red drying.

**Thames Wire & Cable Co., Ltd.,** Brewery Road, Hoddesdon, Hertfordshire. —**Stand S.1.**—Insulated copper wires and strips have coverings of paper, cotton, glass and enamel, etc.

**Thermodare (Great Britain),** York Mansion, 94–98, Petty France, London, S.W.1. — **Stand N.2.** — Night storage heaters; floor heating equipment; and "Micron" infra-red heaters are displayed. New products include a high resistance, low load, floor heating cable and sheath.



*Statter l.v. a.c. switchboard incorporating horizontal draw-out air circuit breakers, 31 MVA rupturing capacity*

**Thermostatic Controls Co.,** Avenue Road, Hampton, Middlesex.—**Stand R.7.** —Metal sheathed, mineral embedded elements for domestic and industrial purposes in straight lengths, preformed to requirements, or as complete units; and thermostats for domestic appliances.

**Bertram Thomas (Engineers), Ltd.,** Worsley Street, Hulme, Manchester, 15.—**Stand O.2.**—A complete six-panel, metal enclosed, 440 V a.c. distribution switchboard with ten outgoing 600 A horizontal draw-out air break circuit-breakers, arranged in double tier formation, is on view. Other exhibits comprise a large selection of d.c. high-speed and semi-high-speed circuit-breakers; electric buffets; tubular heaters; and "Tiltrack" storage equipment for the electrical industry.

**Fredk. Thomas & Co., Ltd.,** Everton Buildings, Stanhope Street, London, N.W.1. — **Stand V.6.** — Tungsten and fluorescent lighting fittings include a range of contemporary three-ply satin opal glass shades. Other exhibits are bedhead lights, ward lights and other special hospital fittings, and classroom, gymnasium and assembly hall lights for schools. A number of fittings are shown for the first time.

**F. W. Thorpe, Ltd.,** Welby Road, Hall Green, Birmingham, 28.—**Stand K.7.** — Vitreous enamelled reflectors; fluorescent battens with reeded "Perspex" fronts for commercial use; "Adjusta-floods" for outdoor lighting; dustproof reflectors; and the new "Thorlux" corrosion-proof fluorescent trough constructed of fibreglass and "Perspex" for acid-laden atmospheres.

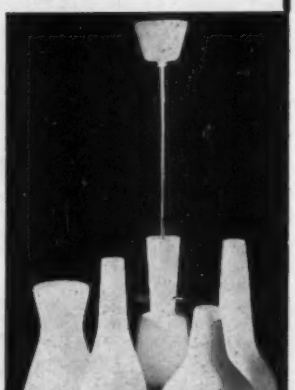
**T.M.C. Harwell (Sales), Ltd.,** 37, Upper Berkeley Street, London, W.1.—**Stand H.14.**—"Temco" wiring accessories include wall and ceiling switches; socket outlets, switched and unswitched; plugs; junction boxes; appliance connectors; and a range of metalclad switch sockets, to B.S. 546 in 5 and 15 A sizes.

**Tricity Cookers, Ltd.,** 109, Kingsway, London, W.C.2. — **Stand K.16.** — In addition to the "Viscount" and Tricity "528" cookers the new "Tricity" three-brush suction polisher is being exhibited.

**Troughton & Young (Lighting), Ltd.,** 143, Knightsbridge, London, S.W.1.—**Stand H.12.**—Lighting fittings include standard lamps; wall brackets; ceiling, pendant and recessed fittings suitable for industrial, commercial and domestic use.

*Above: One of the new range of "Temco" metalclad switch sockets (T.M.C. Harwell (Sales), Ltd.)*

*Taylor model 122A multi-range meter*



*Contemporary 3-ply satin opal glass shades from Fredk. Thomas & Co.'s range*

Among fittings shown for the first time is a range of modular type fittings for recessed ceilings, available with louvres, glass, or dished acrylic plastic diffusers. Also a new type of recessed tungsten fitting to give high levels of illumination with high ceilings.

**Tudor Accumulator Co., Ltd.**, 137, Victoria Street, London, S.W.1.—**Stand H.4.**—A complete "Safetylyte" emergency lighting equipment as supplied to hospitals can be seen in operation. Cells of the open, sealed and high performance ranges as employed in switchgear operation and auxiliary duties in power stations, etc., are also displayed as well as traction and marine cells.

**Tufnol, Ltd.**, Perry Barr, Birmingham, 22B.—**Stand L.12.**—Many of the large selection of electrical components made from "Tufnol" provide mechanical service in addition to electrical insulation. Washers, gaskets and bolt jackets of the type that are assembled into oil pipeline couplings in the Middle East are shown in addition to moulded bell, ball and barrel insulators for working voltages up to 660 V and for loads of up to 2 tons.

**Turners Asbestos Cement Co., Ltd.**, Trafford Park, Manchester, 17.—**Stand U.9.**—Examples of the many applications of "Siluminite" phenolic and melamine resin bonded asbestos paper, felt and laminates are displayed. Laminates black-dyed throughout and melamine-faced phenolic asbestos laminates which provide the advantages of both resins are new developments. In the "Sindanyo" range are electrical arc and heat resisting boards for air circuit-breaker arc shields, foundry core plates, laboratory bench tops, fume cupboards, etc. Ebony grade "Sindanyo" covers insulating boards for switchboard panels, fuse bases and busbar supports.

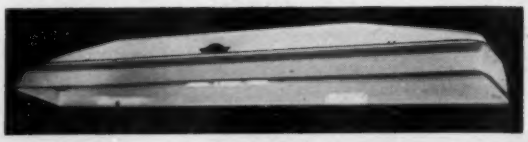
**Tyrad Electric, Ltd.**, Imperial Court, Basil Street, Knightsbridge, London, S.W.3.—**Stand H.12.**—Floor heating, radiant panels, infra-red heaters, block storage heaters and convector heaters, suitable for industrial and commercial use.

**Uni-Tubes, Ltd.**, 1-2, Langham Place, London, W.1.—**Stand E.10.**—"Kopex" pliable electrical conduit which can be set, bent and cut by hand is composed of layers of continuous metal and paper strips. It is produced in continuous lengths, or minimum 100ft coils, in standard electrical sizes from ½ to 3in o.d. and is also available with p.v.c. covering to give protection against corrosive attack.

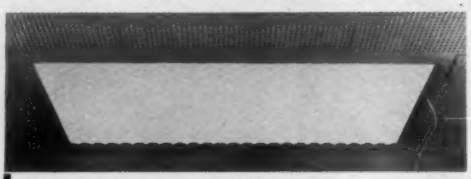
**Vanguard Engineering Co.** (P. H. Fitzgerald & Co., Ltd.), 193-201, Lee High Road, London, S.E.13.—**Stand R.5.**—Fluorescent fittings and control gear for industrial, commercial and domestic lighting, including accessories and tubes; cable trunking, with and without trough reflectors; and a range of transformers for neon sign use.

**Varilectric, Ltd.**, 10, Melon Road, Peckham, London, S.E.15.—**Stand C.1.**—Typical of the company's standard productions are cubicle pattern switchboards incorporating fused switches from their ASTA type tested range; distribution fuseboards; a multi-tier cubicle pattern motor-starter panel incorporating combination fused switch/motor starter units; rising main and overhead busbars with fused plug-in tap-off units; sheet steel cable trunking; and flush and surface distribution fuseboards, with and without isolators.

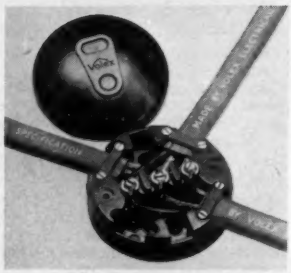
**Venner, Ltd.**, Kingston By-Pass, New Malden, Surrey.—**Stand N.1.**—Among



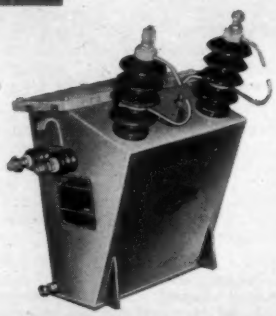
*Thorpe "Thorlux" acid resisting fluorescent fitting*



*One of the Troughton & Young modular type fittings for recessed ceilings*

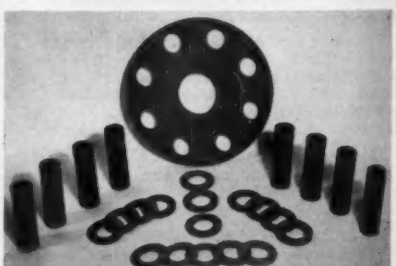


*Volex 30 A joint box*

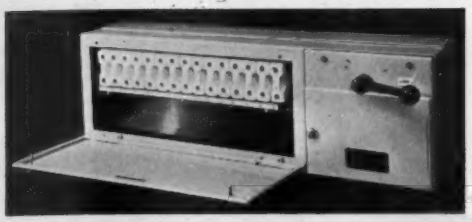


*Woden Transformer Co.'s 5 kVA pole mounting transformer*

*Wallacetown Engineering Co.'s group motor control panel*



*Tufnol gaskets, washers and spacers for oil pipelines*

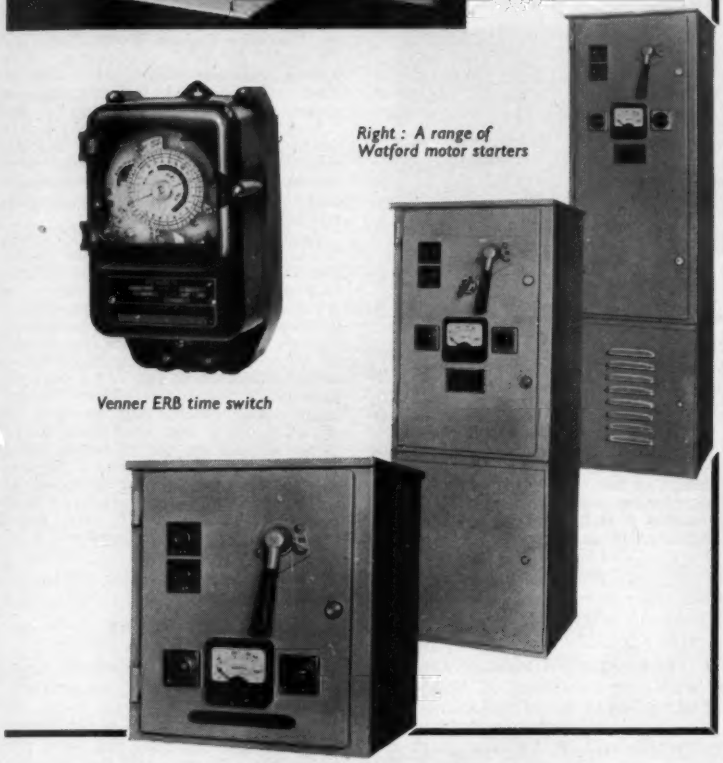


*Varilectric surface type fuseboard with isolator*



*Venner ERB time switch*

*Right : A range of Watford motor starters*



the display of timing devices is one dealing with off-peak heating, showing the savings which can be made. The ERB range of time switches, suitable for off-peak tariff control, are synchronous motor driven with 36 hr spring reserve. Several improvements in design are incorporated in the standard range of MSSP, MSQP, MSSL and MSDC time switches. Transistorised electronic equipment for time and frequency measurement in industrial applications is also shown.

**Vent-Axia, Ltd.,** 9, Victoria Street, London, S.W.1.—**Stand W.4.**—Reversible and type "X" ventilating units and accessories.

**Veritys, Ltd.,** Plume Works, Plume Street, Aston, Birmingham, 6.—**Stand T.10.**—"Maxlume" industrial lighting fittings; flameproof, vapourproof, dust-tight and acidproof fittings; wellglass, bulkhead and marine fittings; fluorescent fittings; a.c. and d.c. motors and control gear; loom motors; transformers; and desk and ceiling fans.

**Victor Products (Wallsend), Ltd.,** Wallsend-on-Tyne.—**Stand T.7.**—New products include fluorescent lighting fittings for hazardous and semi-hazardous areas. Other lighting equipment shown includes interior and exterior flameproof, and industrial weatherproof types, and there is a display of special weatherproof and flameproof junction boxes and mining type flameproof plugs and sockets.

**Volex Electrical Products, Ltd.,** Salford, 6.—**Stand F.2.**—Wiring accessories such as fittings, cables and flexibles are shown in addition to plastic shades. The new V/19 moulded ceiling rose plate not only enables the installation of standard ceiling roses to be carried out to I.E.E. Regulation 207G, but also incorporates an earth or loop-in terminal. With the use of this plate and a two-plate ceiling rose the need for a three-plate rose is eliminated. Another new product is a 30 A three-terminal joint box for use with the heavier cables used in ring main circuits. Each terminal is capable of accepting three 7/·044 conductors.

**W. G. Walker & Co. (Engineers), Ltd.,** Emery Hill Street, Westminster, London, S.W.1. — **Stand J.19.** — "Walker" paddle type dynamometers are among new items shown. Other exhibits are "Mainstay" sheet steel cable trunking and fittings; busbar chambers and insulators; overhead busbar trunking, rising mains and cable entry units; cable-tap systems and trunking; skirting trunking; and floor and under-floor trunking and boxes, cable hangers, pin racks, cable sockets, etc.

**Wallacetown Engineering Co., Ltd.,** Viewfield Road, Ayr, Scotland.—**Stand X.3.**—A selection from the company's range of industrial air-break switch and control gear includes, for the first time, its latest draw-out chassis mounted equipment for medium voltage application. It is available in single, double or multi-tier formation for distribution service or group motor control, the existing pillar type units being retained at present for individual applications. There is also a selection of flameproof gear, including gate end switches, drill transformer panels, lighting transformers and section switches to N.C.B. standard specifications.

**Walsall Conduits, Ltd.,** Excelsior Works, West Bromwich.—**Stand G.7.**—Steel conduit, fittings and accessories are shown. There is a new range of "Multipac" units—a.c. switches, bell pushes and pilot lights built up on grids or switch-plates to suit any installation—and an extended range of miniature circuit-breakers, including models suitable for use in box B.S. 1299; steel cable trunking with clip-on cover; multi-compartment shaped skirting trunking with sliding socket outlets; and fabricated under-floor steel trunking with detachable outlets.

**Wandleside Cable Works, Ltd.,** 106, Garratt Lane, Wandsworth, London, S.W.18.—**Stand S.16.**—A comprehensive range of wires, flexibles and cables includes v.i.r., t.r.s., p.b.j., h.s.o.s. and farm wiring types. P.v.c. polythene and nylon cables are also shown as well as screened flexibles, multicore cables, and "Corrusteel" armoured cables and glands. Among new products are high temperature p.v.c. insulated flexibles and cables.

**Wandsworth Electrical Manufacturing Co., Ltd.,** 136, Cromwell Road, London, S.W.7.—**Stand E.3.**—A large range of electrical accessories, particularly for hospitals, schools, public buildings, etc., includes mercury sparkless switches, switchplugs and special units for operating theatres and bedside units for hospital ward installations. New items include a range of neon pilot light units and 30 A interlocked mercury sparkless switchplugs for mobile X-ray units.

**Watford Electric & Manufacturing Co., Ltd.,** Victoria Street, Westminster, S.W.1.—**Stand G.12.**—Shown for the first time is a new range of starters for use with motors between 5 and 50 h.p. and also covering direct switching, star-delta, auto-transformer or slip-ring in cases of the same cross-section. Standardised interiors are employed and provision has been made for the inclusion of most extras, such as h.b.c. fuses, ammeters, push-buttons, etc. In addition automatic air-break control gear is exhibited in a range of individual starters, control panels and starter switchboards, including a complete 3·3 kV contactor cubicle capable of direct switching motors up to 1,000 h.p.

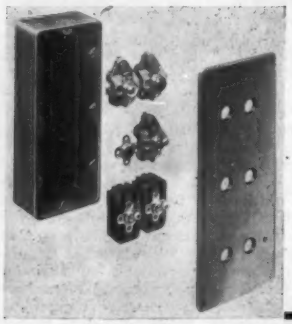
**Watliff Co., Ltd.,** Lombard Road, Morden Road, London, S.W.19.—**Stand M.1.**—Commutators and slip-rings in moulded and built-up construction.

**Weir Electrical Instrument Co., Ltd.,** Bradford-on-Avon, Wilts.—**Stand H.21.**—Electrical indicating instruments include ammeters and voltmeters in moving iron, moving coil, and rectifier types; frequency indicators; bridge type phase sequence indicator; and earth leakage ammeter.

**Westinghouse Brake & Signal Co., Ltd.,** 82, York Way, King's Cross, London, N.1.—**Stand H.10.**—Examples of large

*Westwood Switchgear unit type switchboard*

*Walsall "Multipac" unit*



equipments employing silicon and germanium rectifiers are demonstrated and improvements in selenium and copper-oxide rectifiers are shown, these two established rectifiers being by no means superseded.

**Westwood Switchgear, Ltd.,** 22, Gorst Road, London, N.W.10.—**Stand K.9.**—Typical of "unit-type" switchboards is one made for Barnsley Technical College; it incorporates fuseboards for local lighting and power circuits, with additional busbars at base to give a separate service for welders.

**Whipp & Bourne, Ltd.,** Switchgear Works, Castleton, Rochdale. — **Stand M.14.**—An a.c. cubicle-type switchboard of dustproof construction is equipped with 1,600 A and 900 A air circuit-breakers, a 2,000 A air-break switch, switch-fuses and a relay panel. All the air circuit-breakers are equipped with shutters which cover the back-fixed contacts when the breaker is withdrawn; consequently no "live" contacts can be touched with the breaker in this position. Also exhibited is a d.c. open type board, equipped with semi-high-speed and normal-speed breakers; various a.c. air circuit-breakers; and a pedestal high-speed breaker.

**William White (Switchgear), Ltd.,** 368, Coldharbour Lane, Brixton, London, S.W.9.—**Stand L.21.**—New products include sheet steel fuseboards and hose-proof distribution equipment for use in food factories.

**Henry Wiggin & Co., Ltd.,** Wiggin Street, Birmingham, 16.—**Stand H.2.**—The many uses of the "Brightray" series of nickel-chromium electrical resistance materials in domestic and industrial heating equipment and of the nickel-copper alloy "Ferry" in load regulator resistances for diesel-electric traction are demonstrated.

**Edward Wilcox & Co., Ltd.,** Sharston Road, Wythenshawe, Manchester.—**Stand V.3.**—A new range of fuse cabinets incorporates "H" type fuse units which may be used for rewirable or h.r.c. fuses without change of holder. Each bank contains a "live" warning light, and in each cabinet one of these lights enables an on-the-spot test for fuses to be made. They are available in ratings of 5–15 A and 15–30 A, with standard ways of 4, 6, 8, 10 and 12. "Slydlok" vibration-proof fuses and associated equipment ranging from 5 to 100 A are also shown.

**Woden Transformer Co., Ltd.,** Moxley Road, Bilston, Staffs.—**Stand L.9.**—Distribution transformers between 8 and 500 kVA are shown including a new design of low loss, pole mounting, rural distribution unit using cold rolled, grain oriented "C" cores. This design is exhibited in 5, 15 and 25 kVA ratings. There is also a wide range of cast resin and hermetically sealed transformers for electronic applications. Details of the Woden "Clear Mesh" screen heating equipment, and precision solenoids and relays for use on guided weapons, aircraft and similar applications are also displayed.

**Yorkshire Imperial Metals, Ltd.,** P.O. Box No. 166, Leeds.—**Stand O.5.**—This is a new company which represents the merging of the copper and copper-base alloy tube, fittings and plate activities of the Yorkshire Copper Works, Ltd., and Imperial Chemical Industries, Ltd. Among exhibits shown are condenser tubes and ferrules in a wide range of alloys including "Yorcalbro" and "Alumbro" (aluminium-brass); high conductivity copper tubes for busbars, etc.; "U" tubes in a range of alloys for feed water heaters; and hydrogen cooler tubes (square and rectangular section) for turbo-alternators.

**Zenith Electric Co., Ltd.,** Zenith Works, Villiers Road, Willesden Green, London, N.W.2.—**Stand X.4.**—Exhibits include a comprehensive range of "Variac" regulating transformers; a single-phase meter testing equipment; together with a phase-shifting transformer; an automatic voltage regulator with a rating of 24 kVA at 240 V ±1 per cent; flash testing equipment; and a "Variac" motor speed control unit operating on an a.c. supply but controlling a d.c. motor without the use of valves, being, therefore, capable of instant starting. Other products are tubular sliding adjustable resistances; transformers; choke coils; and "Ceramite" wire wound embedded tropical grade resistors.

## Northern Aluminium Expansion Plans

The Northern Aluminium Co., Ltd. (fabricating subsidiary of Aluminium, Ltd.), plans to spend £10 million over the next four years, nearly £8 million of which will be for new plant and buildings. The major part of this programme will be the expansion of the company's aluminium rolling mill at Rogerstone, Monmouthshire, raising its annual capacity to 75,000 tons in such a way that a further increase will be possible—at a relatively low cost per ton—to an ultimate capacity of 175,000 tons. The remainder of the investment will be in further modernisation of the Banbury and Birmingham works.

This was announced on 12th March by Field Marshal the Earl Alexander of Tunis, K.G. (chairman), at a reception held at Rogerstone to mark the coming into service of new equipment for the production of stretched aluminium alloy plate to meet the requirements of the aircraft industry, and the completion of a new office block. To finance this expansion, Aluminium, Ltd., is making a further dollar investment in the company by subscribing for £3,000,000 of new ordinary share capital. Northern Aluminium plans to raise an additional £3,000,000 on long-term loan, and to find the balance from retained earnings and depreciation.

Principal additions to the plant for this development will include a 12ft wide hot mill for "breaking-down" ingots and rolling large plate; the addition of a third stand to the present two-stand hot-finishing mill, with provision for a fourth; and the introduction of hot coiling under tension direct from this mill. Preheating, annealing and re-melting furnaces will be among the ancillary equipment installed to serve the new "hot line," and cold-rolling facilities will also be augmented. Complementary to this are a 4,000-ton stretcher for stress-relieving and flattening plate, a plate heat-treatment furnace, a high-speed plate saw for accurate finishing, and apparatus for testing ultrasonically the internal soundness of thick plate, all of which have just been put into commission.

### Institute of Metals Golden Jubilee

The golden jubilee banquet of the Institute of Metals will be held, under the presidency of Marshal of the Royal Air Force Lord Tedder, at Grosvenor House, Park Lane, London, W.1, on Thursday, 1st May. The principal guest will be Lord Hailsham, Lord President of the Council, who will be accompanied by Lady Hailsham.

Tickets (two guineas each) can be obtained from the secretary of the Institute, 17, Belgrave Square, London, S.W.1.

# Development in South Scotland

## BOARD'S THIRD ANNUAL REPORT

FOUR outstanding events marked the past year's operations of the South of Scotland Electricity Board, whose annual report and accounts* were published last week. They were the formal commissioning, at Barony, of the first generating station in the United Kingdom designed to burn washery slurry; the starting of work on the Hunterston nuclear power station; approval of the construction of a 275 kV supergrid system; and completion of the change-over of the remaining non-standard distribution services in the Board's area. Good progress was also made with the development of off-peak load, particularly electric floor warming of which the Kirkcaldy all-electric flats represent a pioneer example.

The main trading results for the year covered by the report (to 31st December, 1957) were briefly recorded in last week's issue. They included a surplus of £517,872 and an increase in electricity sales of 5 per cent to a total of 5,562 million kWh. The surplus, equivalent to 1·5 per cent of revenue, was less than half the 1956 balance (£1,165,588), but is not unsatisfactory in view of the several adverse factors which influenced the Board's finances. The most important were the substantial increases in fuel prices, further pay awards, the sharp rise in interest rates towards the end of the year, and the depression of sales owing to the milder weather conditions prevailing. On the higher costs, a warning is given that their full effect will become apparent in the current year. "No general review of tariffs has been made since October, 1955," the Board states, "and the point is now being reached where, despite expansion of electricity sales, present tariff levels can no longer provide sufficient revenue to meet growing costs, even with the best that can be done by way of technical and administrative efficiency." With a heavy programme of capital development to be carried out, charges for depreciation and interest must continue to rise.

Last year's 5 per cent increase in sales, though less than the previous year's 8·7 per cent, was above the average for England and Wales (4·4 per cent); for the North of Scotland the figure was 5·4 per cent. An analysis is given in Table I and the rate of development since 1949 is graphically portrayed in Fig 1.

In accordance with the plan published in 1956, the extension of supplies to rural communities advanced steadily, over £750,000 being spent. With 677 additional farms connected, 80 per cent of all farms in the District are now receiving a supply. Increasing interest is being shown in grass and grain drying equipment.

TABLE I.—INCOME AND SALES

| Class of Consumer | Income | | Electricity Sales | | Revenue/kWh | | Number of Consumers | |
|---|---|---|---|---|---|---|---|---|
| | 1956 | 1957 | 1956 | 1957 | 1956 | 1957 | 1956 | 1957 |
| | £ (000) | £ (000) | kWh (000) | kWh (000) | d | d | | |
| Domestic ... | 9,820 | 10,332 | 1,570 | 1,665 | 1·501 | 1·489 | 1,127,184 | 1,155,554 |
| Farms ... ... | 642 | 694 | 105 | 113 | 1·475 | 1·473 | 12,186 | 12,863 |
| Commercial ... | 5,644 | 5,920 | 765 | 814 | 1·770 | 1·746 | 115,552 | 116,642 |
| Industrial ... | 15,291 | 16,420 | 2,749 | 2,859 | 1·335 | 1·378 | 11,296 | 11,450 |
| Public lighting ... | 567 | 655 | 104 | 111 | 1·306 | 1·418 | 140 | 140 |
| Traction ... ... | 33 | — | 6 | — | 1·329 | — | 1 | 1 |
| Total ... ... | 31,997 | 34,021 | 5,299 | 5,562 | 1·449 | 1·468 | 1,266,359 | 1,296,650 |

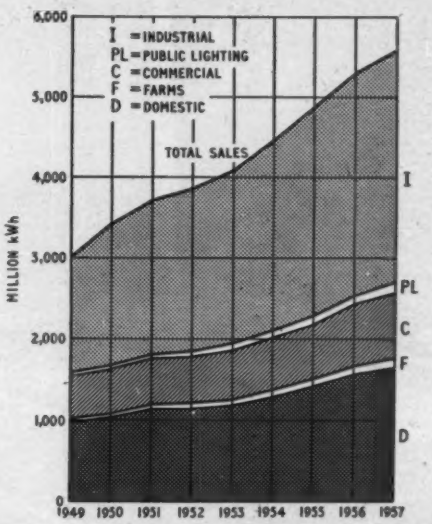
Off-peak supplies were provided during the year for large arc and induction furnaces, tar heating and the pre-drying of silica firebricks by means of heated floors. Further floor warming installations were also connected. The Board has carried out investigations into the performance of installations of this kind in domestic premises, schools and public buildings, and has also made a special study of block storage heaters, particularly the possible use of lightweight blocks. Representations have been made, so far without success, against the ban on the use of block storage heaters in domestic premises (being free of purchase tax, they are at present only available for commercial and industrial premises). At 31st December last the total off-peak load was 124,606 kW of which 32,212 kW was connected during the year. The additional load was divided as follows:—Commercial 21,530 kW, industrial 6,499 kW, domestic 3,533 kW and farms 650 kW.

Investigations were made into the application of high-frequency heating to meet special requirements and the Board anticipates considerable development in this field.

A further 12,800 street lamps were connected last year and the Board now provides supplies to 88 per cent of the public lamps in the District.

The installed generating capacity at the end of the year was 1,489 MW, a net increase of 121·5 MW after allowing for obsolete plant taken out of service and other plant uprated. New plant commissioned included a second 60 MW set at Dalmarnock and a second 30 MW set at Barony. The main conventional-fuel station now under construction is that at Kincardine which, when completed, will have a capacity of 760 MW—three 120 MW sets in

*Fig. 1.—Growth of sales in South Scotland*




* H.M. Stationery Office, Edinburgh.

TABLE II.—ELECTRICITY GENERATED AND PURCHASED

| | Million kWh | % of Total | Cost £000 | Cost/kWh 1956 | Cost/kWh 1957 |
|---|---|---|---|---|---|
| | | | | d | d |
| Generation in South Scotland: | | | | | |
| At steam stations ... ... | 5,098 | 82·23 | 17,546 | 0·790 | 0·826 |
| At hydro stations ... ... | 304 | 4·90 | 254 | 0·219 | 0·201 |
| | 5,402 | 87·13 | 17,800 | 0·759 | 0·791 |
| Interchange: | | | | | |
| North of Scotland Board, net import ... ... ... | 393 | 6·34 | 2,357 | 1·529 | 1·441 |
| Central Authority, net import | 362 | 5·84 | 1,085 | 0·802 | 0·718 |
| Purchase ... ... ... ... | 43 | 0·69 | 120 | 0·770 | 0·672 |
| Total ... ... ... | 6,200 | 100·00 | 21,362 | 0·802 | 0·827 |

the first half and two 200 MW sets in the second half. The first set is due for commissioning at the end of this year.

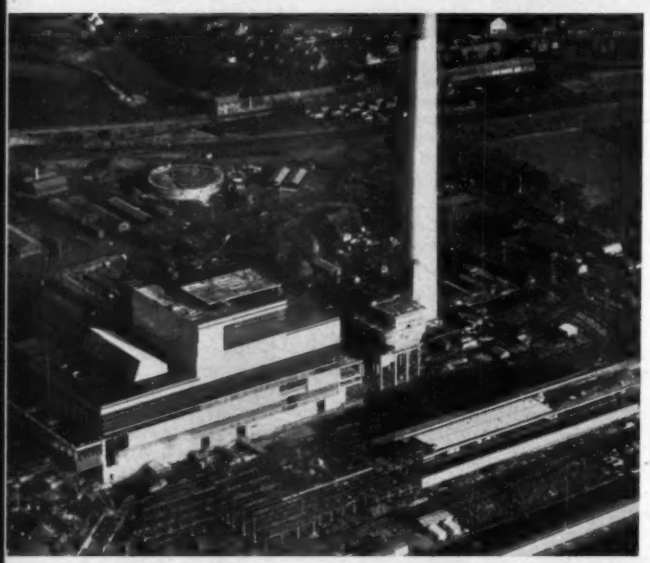
The maximum demand on the Board's system (1,518 MW) occurred between 4.30 and 5 p.m. on Tuesday, 10th December, 1957 (see Fig. 2); in 1956 the m.d. of 1,406 MW was recorded at 5 p.m. on 27th December.

Since 1951 there has been a progressive improvement in the average thermal efficiency of the Board's steam stations. Last year's figure of 25·94 per cent compares with 25·04 per cent in 1956, representing a saving of 101,000 tons of coal during the year. Portobello high-pressure station returned the highest efficiency with 30·68 per cent. Hydro-electric stations in Galloway and Lanarkshire produced 304 million kWh, equivalent to a saving of 291,000 tons of coal. Details of electricity generated and purchased, with costs per kWh, are given in Table II.

Agreement was reached whereby the Board will, in 1962 and later years, provide supplies of energy to the North of Scotland Board during off-peak times up to 570 million kWh annually. In the event of a shortage of water in the North of Scotland District during the summer months, additional supplies will be given, if desired. The arrangements with the Central Authority under which the two systems are run interconnected at all times, were continued, and it is estimated that during the year there was an overall saving in fuel by this means of 30,000 tons.

The steady growth of load in South Scotland, coupled with the siting of large generating stations at points some distance from the main load centres, made it necessary to examine the demands likely to be made on the Board's main transmission system. As a result, the construction of a 275 kV supergrid system was approved, covering 273 circuit-miles of overhead line and five new 275 kV substations. The bulk of this work is scheduled for completion by 1963.

*Kincardine generating station, where the first 120 MW set is scheduled for commissioning towards the end of this year*



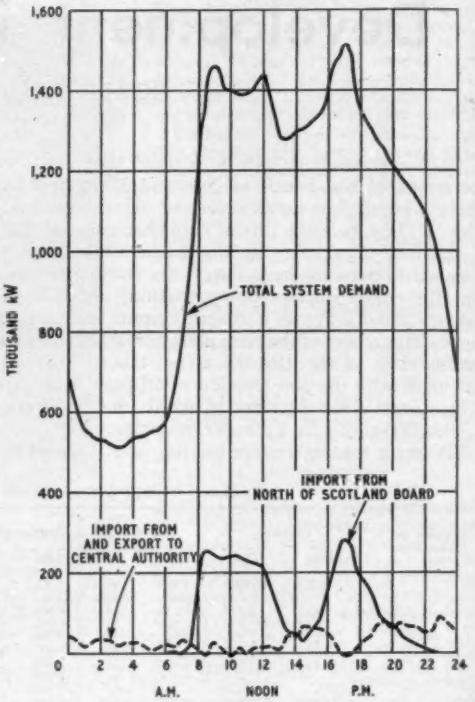



*Fig. 2.—Variations in demand on 10th December, 1957, the day of maximum demand*

The remaining d.c. and non-standard a.c. consumers were changed over to standard a.c. supplies and all consumers in the Board's District are now supplied with alternating current at a uniform voltage. Since 1st April, 1948, 36,650 d.c. and 365,000 non-standard a.c. consumers in South Scotland have been changed over without charge to the consumers concerned.

In view of the difficulty in obtaining suitable substation sites in urban areas and to demonstrate that distribution transformers could operate satisfactorily when directly buried in the ground, a 500 kVA unit, designed in collaboration with a transformer manufacturer, was put into service in the Clyde Area.

Income from the sales of electricity totalled £34 million, an increase of 6·3 per cent over 1956. The average price per kWh sold was 1·468d as against 1·449d for the previous year. Other income and the surplus on the contracting and sales of fittings account brought the trading income to £34·4 million. Of the £517,872 surplus, £500,000 has been transferred to general reserve which now totals £2 million and the remainder added to the balance carried forward, which now stands at £272,284.

The average price of fuel per ton, adjusted for calorific value, increased from 86s 10d in 1956 to 91s 8d in 1957. Fuel costs accounted for 37 per cent of the revenue expenditure for the year.

For the local rating year 1957-58 a contribution of

£1·43 million was made to the Secretary of State for distribution to local authorities in South Scotland. The corresponding figure for the previous year was £1·26 million. In the last ten years the rate contribution has gone up by 74 per cent.

Capital expenditure for the year, again restricted in accordance with Government policy, totalled £19·24 million. Working capital fell by £1·66 million, leaving a net capital investment of £17·58 million.

The number of persons employed by the Board at 31st December, 1957, was 11,624 compared with 11,377 a year before. Upwards of 40 of the technical staff are now being trained in nuclear generating station practice.

Premises at Cathcart were purchased and are being adapted to accommodate the whole of the head office staff, at present spread over numerous buildings in Glasgow.

The Consultative Council, in a separate report, refers to the provision of a supply to Holy Island, after two years' delay, as an important event which emphasises the Board's aim to supply electricity even to isolated communities. Mention is made of the increasing number of tenants of council houses who have expressed a preference for electric cooking where given freedom of choice. The Council is in favour of the early reintroduction of hire schemes, for which it is considered there is a definite demand.

# Mercury-Arc Invertors in Induction Heating

THE discussion of the paper presented at the Institution of Electrical Engineers on "The Use of Steel-Tank Mercury Arc Invertors for Generating Medium Frequencies for Induction Heating" and summarised in our last issue was opened by Dr. R. H. Barfield (Wild-Barfield Electric Furnaces). This was, he believed, the first practical engineering paper on the subject and he asked whether the authors thought their ideals would be attainable. This would be well worth doing. One would like a unit somewhat resembling a transformer, occupying a place of the same order for a given time, and contained in a sealed case having enough input and output terminals and possibly a manually operated voltage adjustment. The frequency would adjust itself automatically to give unity power factor under a varying load. Impedance would be of the same order as for a transformer with the equivalent time rating, and the power conversion efficiency would be at least 90 per cent. Life and maintenance would be comparable with those of a first-class transformer.

Dr. W. G. Thompson (G.E.C.) said that static methods for producing high frequency would appear to be constrained by the need to have the operating conditions in the invertor fixed by the parameters of the valve device used for generating the high frequency. The present arrangement was no exception. The difference between it and earlier methods was that conversion was by means of mercury vapour. The electrons were ionised atoms as distinct from the high vacuum valve where the electron discharge was relied upon. This caused physical complications, and he wondered whether it would not be simpler to take a straight high-voltage mercury-arc rectifier and do the high-frequency generation in two separate single anode vessels. Machines for high frequency heating were noisy, and if this static apparatus was reasonably quiet, it would be a great gain.

Mr. J. Terry (T.I. Group Services) described his own experience with an installation of the type referred to and said that the invertor appeared to be extremely sensitive to temperature. Starting-up troubles, particularly in cold weather after the week-end shut-down, were common. Although the absence of noise and the avoidance of foundations were claimed as advantages, recent and current developments in rotating machines were narrowing if not eliminating the margin in favour of the mercury-arc frequency convertor.

Mr. D. I. Spash (Radyne, Ltd.) understood the application of the equipment to billet heating involved the use of frequencies of 50 to 60 kc/s for preheating, followed by 3 kc/s from a motor generator for the final heating to the forging temperature of, say, 1,200 deg C. This was a typical combination of two forms of equipment for 3 to 4in diameter billets. For heating small billets 3 kc/s or higher was necessary to secure reasonable efficiency. In melting, stirring occurred if too low a frequency was employed. This was detrimental both metallurgically and to the life of the crucible. He asked whether glass-bulb invertors had been considered.

Mr. K. F. Raby (B.T.H.), speaking as a designer of motor alternators, said that the modern trend was towards a compact set with integral water-cooling, mounted on resilient supports and requiring no special foundations. It could be built with a vertical instead of a horizontal shaft to save floor space.

Mr. J. Glen (Hackbridge & Hewittic) said that glass bulb rectifiers had been used on a similar project in which he had recently been interested. In his opinion, the mercury-arc convertor offered technically and operationally a satisfactory alternative to the motor alternator. This type of convertor being static, the equipment should prove very satisfactory and competitive provided the power could be increased and the size decreased.

Mr. P. L. Lowrie (British Geco Engineering Co.) said that some of the advantages claimed for the invertor applied equally well to motor alternators. For instance, voltage variation of the power control, which was done on the invertor by grid control, was done on the generator by field control. He thought the steel rectifier manufacturers were to be congratulated on getting their equipments into service before the glass-bulb manufacturers, seeing that they were junior partners, having come into the rectifier business more recently.

Mr. M. G. Gibbs (Wild-Barfield Electric Furnaces) asked whether it would not be safer to limit the frequency at which satisfactory inversion took place to between 1,400 and 1,500 kc/s. Above that, a certain amount of instability appeared to arise, though it might be due to the particular conditions under which the melting furnace was operated. The initial work on these invertors was done some years ago when h.f. alternators and rotating machines were difficult to obtain in this country. They seemed to be running into a similar situation with the change over from horizontal to vertical spindle alternators. It was extremely difficult to obtain satisfactory equipment of the latter type manufactured in this country.

### Rubber Production and Consumption

Statistics prepared by the Secretariat of the International Rubber Study Group show that last year the production of natural rubber reached 1,887,500 long tons and consumption (including estimated imports into the U.S.S.R. and China) was 1,880,000 tons. The stocks at 31st December last stood at 747,500 tons, an increase of 20,000 tons on the 1st January, 1957, figure.

The production of synthetic rubber in 1957 was 1,262,500 tons and consumption reached the same figure. Stocks at the end of the year amounted to 267,500 tons.

# Nuclear Power Programme

## James Forrest Lecture before the Institution of Civil Engineers

THIS year's James Forrest Lecture was delivered before the Institution of Civil Engineers on 18th March by Sir John Cockcroft. His theme was the development of nuclear power since his previous James Forrest Lecture in 1955, three months after the publication of the White Paper setting out the Government's provisional plans for providing 1,500 to 2,000 MW of nuclear power plant by 1965. The subsequent projected increase in capacity to between 5,000 and 6,000 MW he attributed to straightforward engineering development of the Calder Hall design. Reactor size and, correspondingly, the amount of uranium fuel, and heat extraction from each ton of uranium had all been greatly increased for the first four stations now being built for the Electricity Board. Fuel surface temperature had been raised from 410 to 425 deg C and $CO_2$ gas pressure was 50 per cent higher.

For the second stage in the programme the possible use of liquid cooling had been considered. The first example was a graphite-moderated reactor with liquid sodium coolant. Although a gas outlet temperature of 500 deg C and a thermodynamic efficiency of 37 per cent seemed possible, these advantages appeared to be outweighed by the need (due to neutron loss) to employ costly fuel enrichment to twice the natural content of U235. Incompatibility with graphite, corrosion and probably heavy maintenance were other drawbacks.

Pressurised-water and boiler water reactors needed smaller pressure vessels, but they also required enriched fuel, which though readily available in the U.S.A., because of the enormous diffusion plants there, would not be economic in Europe. Fuel costs in Britain would be about 0·35d/kWh and overall costs would be unlikely to fall below 0·7d/kWh.

Two other designs of greater promise were now under investigation—the advanced gas-cooled graphite-moderated reactor (A.G.R.) and the gas-cooled heavy-water-moderated type. In the first the aim was to decrease capital costs by 30 per cent through increasing the surface temperature of the fuel elements to 600 deg C and using clusters of small fuel elements of sintered uranium-oxide (which had a melting point of 2,400 deg C) sheathed probably in beryllium and using a slightly enriched fuel. This would give fuel costs about the same as for the first generation reactors, i.e. 0·16d/kWh so that with a capital cost of £80/kW and a load factor of 70 per cent, overall costs should come down in 1970 toward the 0·47d/kWh which had been predicted by Sir Christopher Hinton.

For the heavy-water reactor fuel costs should be lower than for the A.G.R., only very slight fuel enrichment being required. Heavy water could probably be produced in the United Kingdom at £20,000/ton and would contribute from £10 to £15/kW to the capital cost of £80/kW for an electrical output of 500 MW. Substitution of ceramic fuel elements (a mixture of graphite, uranium and thorium) for metal sheaths in gas-cooled reactors might allow an increase of outlet gas temperatures to 700 deg C, thus further increasing ratings.

Uranium supplies were now known to exceed the quantity required up to the late 1970's, so the original urgency for developing the fast reactor had largely disappeared. It might, however, be the most economical way of burning the by-product plutonium of the thermal reactor stations.

In the long run fusion reactions in deuterium might replace fission reactors. The initial performance of Zeta pointed the way to design for 100 million deg, when the energy output would approach the energy input.

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## *Cartridge Fuse-Links*

AMONG the recently issued publications of the British Standards Institution are two standards relating to cartridge fuse-links. The first of these, B.S. 646 : 1958, is a revised publication dealing with non-rewirable fuse-links with current ratings up to 5 A, intended for use in plugs and socket-outlet adaptors to B.S. 646, for two-wire circuits with the declared voltages not exceeding 250 V. It thus relates only to the cartridge fuse links included as Type A in the 1935 edition.

Standard current ratings of 1, 2, 3 and 5 A are specified for use according to the loading of the appliance for which the plug is required; and there is a colour code by which the current ratings are distinguished. The revised B.S. 646 specifies new requirements for performance and tests. The breaking capacity has been raised to values corresponding to categories of duty A.C.1 and D.C.1 as defined in B.S. 88. The Standard deals with voltage rating, current ratings, fusing factor, breaking-capacity rating and performance. The section on tests specifies the use of both a.c. and d.c. for all tests for duty. The fuse-links for use in the plugs specified in B.S. 1363 are separately provided for in B.S. 1362.

The fuse-links dealt with in B.S. 2950 : 1958 supersede the Type B fuses which were specified in B.S. 646 : 1935. They have the same dimensions as the old Type B fuses but the performance differs in two important respects. Firstly, the rated voltage varies according to the rated current, being 1,000 V for the smaller currents (50 to 250 mA) down to 32 V for currents of 20 and 25 A. Secondly, since under the conditions in which these fuse-links are intended to be used the prospective fault current is restricted, the breaking-capacity test is made at a prospective current that does not exceed 10 times the rated current of the fuse link.

The main object of the standard is to specify cartridge fuse-links of a quality that experience has shown to be adequate for their purpose, without adding to their cost or requiring extensive proving tests. Since the cost of producing fuse-links giving a close degree of protection increases with the smaller currents, and critical protection is not always required within this range, two grades of fuse-link, A and B, are specified for rated currents of 250 mA and below, which will blow at two or three times their rated currents respectively. A preferred range of rated currents and voltages is given together with an optional colour code.

Copies of these standards may be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 4s 6d for either B.S. 646 or B.S. 2950.

# INDUSTRIAL NEWS

## Electrical Contractors' Conference

The programme for the annual conference of the Electrical Contractors' Association and its allied organisations (Folkestone, 18th-20th May) is generally on the lines of previous conferences. On Sunday, 18th May, delegates will register at the Metropole Hotel and in the evening there will be a "Get Together." Monday's proceedings open with a civic welcome, followed by the presidential address by Mr. H. S. Wathes and an open session for members only. The afternoon will be devoted to a "social occasion" and the Mayor of Folkestone will hold a reception in the evening (with dancing) at the Leas Cliff Hall.

On Tuesday morning Mr. E. Harrison, A.M.I.H.V.E., M.Inst.F., will present a paper on "Design in Space Heating." In the afternoon there will be a "Questions and Answers" session and the new president will be installed. At the Grand Hotel in the evening the president's reception will take place.

## Equipment for Russian Tyre Factory

Last September we reported that a contract, valued at £7·5 million, had been placed by the Soviet Union for plant and equipment for a tyre factory being built at Dnepropetrovsk with Rustyfa, Ltd., the British consortium, the members of which are David Bridge & Co., Ltd., Crompton Parkinson, Ltd., Lancashire Dynamo (Holdings), Ltd., Mather & Platt, Ltd., and Francis Shaw & Co., Ltd. A second contract, valued at more than £5 million, has now been placed with the consortium in connection with the same factory.

## E.D.A. and Purchase Tax

In a memorandum to the Chancellor of the Exchequer the British Electrical Development Association again puts the case for the exemption of domestic electrical appliances from purchase tax. It is particularly emphasised that these appliances are not luxuries but necessities in the modern home and that they make the best use of the nation's coal. Attention is drawn to the inequity of exempting oil-burning appliances (which rely on imported fuel) while electrical equipment is heavily taxed.

The many advantages of electric water heating are dealt with, particularly from the clean air aspect, and the benefits of thermal storage block heaters are set out. It is noted that while block storage heaters for commercial and industrial use do not bear tax, it has not been possible to produce a domestic model because of the high initial cost and the purchase tax to which it would be subject. There has been difficulty in defining a storage block heater but it is claimed that it has been got over by a generally-accepted definition. This stipulates that 60 per cent of the energy supplied to the heater during a period of from four to nine hours shall be emitted after disconnection.

The Association claims that these heaters would give the Electricity Boards a valuable off-peak load and consumers would enjoy a low tariff and an economical, clean and automatically controlled heating system. Therefore the Chancellor is asked to permit the sale of these heaters free of purchase tax.

## Atlas Fluorescent Ceiling

A new ceiling lighting system, the "Sylvalume," which combines the functions of a decorative ceiling and an efficient lighting installation has been announced by Atlas Lighting, Ltd. It can be extended over any ceiling area, regardless of shape or size, with a variety of effects. Despite the flexibility of the system, the standard components are few and simple and it can be installed easily and quickly in old or new buildings at a cost comparable with any normal suspended ceiling and its lighting fittings.

A new form of lighting trunking has been specially designed for use with the system. This trunking, supported at convenient points from the building structure, carries the control gear and cables and cross-beams between the trunking sections hold the fluorescent tubes. The tubes used are the 8ft 125 W type and they can be fixed at any point along the beam. Fixing centres are determined by the number of tubes used to achieve the required light level. From the trunking an extruded aluminium grid, based on the 3ft module, is suspended. Within it 3ft sq "Vinyl" sheet diffuser panels of different textures, colours and forms can be arranged in almost limitless variations. The panels are clipped into the grid by a spring attachment.

Perforated metal baffles with glass fibre filling can be used to give visual interest to the ceiling as well as improving its acoustic properties. These baffles, which measure 3ft in length, are in yellow, black or white, and can be fixed to the grid in any desired geometric pattern. All metalwork in the suspended ceiling is finished in white with the exception of the suspension set which is plated. The odd perimeter areas can be filled in with hardboard or other panelling which would be cut to shape on site. Advantages of the system are its complete flexibility from the point of view of design, its mechanical simplicity and the scope offered for changes of design after installation.

## British Trade Fair at Lisbon

A British Trade Fair is to be held in Lisbon from 29th May to 14th June, 1959. This was approved on 12th March by the Grand Council of the Federation of British Industries. The Fair will be organised by British Overseas Fairs, Ltd., on behalf of the F.B.I. and will include a programme of public events. It will be held in Lisbon's new exhibition hall, which has been used for only one previous exhibition.

Britain is Portugal's best customer, and there is great goodwill towards this country in Portugal. Traditionally Britain has always been the principal

*A typical Atlas "Sylvalume" ceiling designed for a motor-car showroom*

exporter to Portugal, but recently Germany has taken the lead in the Portuguese market, though she buys from Portugal only a relatively small proportion of goods in return. The time is therefore ripe for a special endeavour by British industry to regain the lead it held so long in the Portuguese market.

The figures of British exports to Portugal and her overseas territories for the past two years are as follows:—Portugal, 1956, £20·6 million; 1957, £20·4 million. Portuguese overseas territories, 1956, £11·4 million; 1957, £11 million. It is estimated that a special export drive to Portugal could lead to a swing of trade to Britain of some £5,000,000 to £6,000,000 a year. The Federation's decision to go ahead was taken after consulting trade associations, former B.I.F. exhibitors and the British Chamber of Commerce in Portugal, all of whom have indicated strong support.

### Computer for Norway

The Central Bureau of Statistics of Norway has announced that, with the sanction of the Norwegian Government, it has placed an order with the English Electric Co., Ltd., for a "DEUCE," the electronic digital computer manufactured by the company. Applications of the computer will include analysis of foreign trade statistics, the analysis of the Norwegian Census of Population and the mathematical analysis of various statistics to establish economic trends. The computer will also be offered to other commercial and scientific organisations.

### Carriage Heaters for British Railways

The General Electric Co., Ltd., has received an order from the Eastern Region, British Railways, for 8,960 convector-type heaters to be installed in new multiple-unit rolling stock for the Region's forthcoming 25 kV, 50 c/s, single-phase electrification. The heaters are of 500 W rating and are required to operate on a nominal 240 V supply derived from the motor coach transformer, with a possible maximum of 315 V. Elements are Alumbro-sheathed and fitted into mild steel cases with expanded metal front covers. This order follows one for 448 water heaters for the same rolling stock which was placed with the G.E.C. last year.

### Wholesalers' Meeting and Dinner

The annual general meeting of the Electrical Wholesalers Federation will be held next Thursday (27th March) at the Dorchester, Park Lane, London, W.1. At a private luncheon of members that day the president, Mr. C. H. Blackburn, will make a presentation on behalf of members to Mr. A. B. Wildsmith, the former director, who recently retired.

The annual dinner in the evening (6.30 for 7 p.m.) will also be held at the Dorchester and Mr. Leslie Gamage, M.C., M.A., will be the principal guest. Sir Harold Bishop, C.B.E., director of technical services, B.B.C., will respond to the toast of the guests.

### Brussels Exhibition

In an article contributed to the *Manchester Guardian*, Sir Norman Kipping, director-general of the Federation of British Industries, referring to the British Industry Pavilion at the Brussels Exhibition, says:—

"All too often one hears or reads things overseas suggesting that Britain is out of date; one might almost assume that nothing was ever invented outside the United States and the U.S.S.R. I don't give much for our national flair for publicity and public relations, but Brussels is, I believe, going to be an exception; after seeing what Britain has to show there, in both the Government and industrial pavilions, any such misconceptions should vanish. This is specially so in the field of electric power and nuclear energy, for it is here that the exhibits are strongest."

The Exhibition is being opened by the King of the Belgians on 17th April. As we reported last week, the progress made with the equipping of the Pavilion has been very satisfactory.

### "Mechanicals" Exempted from Rates

The Lands Tribunal, on 11th March, heard an appeal by the Institution of Mechanical Engineers from a decision of the Central London Local Valuation Court that the Institution was not a "scientific society" under the terms of the Literary and Scientific Societies Act, 1843. The Court therefore confirmed the Westminster City Council's assessment of the Institution for rating purposes at £6,000 gross and £4,997 net.

The Tribunal allowed the appeal and thus exempted the Institution from paying rates. The president of the Tribunal, Sir William Fitzgerald, held that "science" used in relation to mechanical engineering meant applied science and there was an element of art in all applied science. He accepted the Institution's contention that the promotion of the development of mechanical engineering meant the increasing of scientific data so that mechanical engineering could be carried out by the application of discovered scientific principles rather than by "intuition or guesswork." Thus he held that the Institution was founded exclusively for the purpose of science and should be exempted.

We believe that similar appeals had been lodged by the Institutions of Civil and Electrical Engineers.

### Electricity Supply Handbook

The 1958 edition of the "Electricity Supply Handbook" is now available from the *Electrical Times*, Sardinia House, Sardinia Street, London, W.C.2, price 10s. It is the eleventh in the series and the general arrangement follows that of previous editions. Several appointments to the Electricity Council and the Central Electricity Generating Board had still to be made at the time of going to press, and consequently the post-vesting reorganisation is not quite complete. New appointments which were at that time confirmed are, however, clearly differentiated.

Although no new sections have been included the number of pages has been increased to 215. In addition there are the useful maps showing boundaries of Areas, Sub-Areas and Districts with location of appropriate headquarters and service centres. A pocket on the inside back cover contains a 3-colour folding map showing generating stations and transmission lines as at April, 1957.

### Simplex Diamond Jubilee

On 26th March, 1898, the Simplex Steel Conduit Co., Ltd., was registered with the object of manufacturing steel tubes and fittings. These were for the protection of electric cables, and were offered as a complete system—the first to be specifically designed for the purpose. Thus was born the Simplex steel conduit system. Later the name of the company was altered to Simplex Conduits, Ltd., which became one of the four firms to form the nucleus of Tube Investments, Ltd., in 1919. In 1932 the name was again changed to its present form, Simplex Electric Co., Ltd., consequent on a merger with another of the original T.I. companies, Credenda Conduits Co., Ltd. To-day the Simplex organisation is responsible for a wide variety of products, including switch and fuse gear, flameproof equipment, accessories, etc., and the "Creda" range of cookers and domestic appliances.

The name Simplex will, however,

*The cover of the first Simplex catalogue of its steel conduit system*

always be associated with the steel conduit system, and to mark its diamond jubilee the company has recently announced new and competitive prices for conduit fittings, in a new and alphabetically referenced publication. As an interesting relic of a more spacious and leisurely age, the cover design of the original 1898 price list is reproduced herewith.

## Welding Equipment Exhibition

The next exhibition to be held in the Midlands Electricity Board industrial showroom, 247, Chester Street, Aston, Birmingham (from 24th March to 3rd April), will display a wide range of welding equipment and electrodes. The exhibition is being held in conjunction with the English Electric Co., Ltd.

## "Blue Book"

The 1958 edition of the Electrical Trades Directory — the *Electrical Journal* Blue Book—is now available. Its general arrangement follows closely previous editions, its twelve sections covering the various branches of the electrical industry and its products. The electricity supply section contains details of the structure of the Electricity Council and the Central Electricity Generating Board and its Generation Divisions, although at the time of going to press these two authorities were in process of reorganisation and full details of the chief officers and personnel were not available. This section also covers the Area Boards, Consultative Councils, and the Scottish and Irish Boards. In "Section V Engineers" some of the sub-divisions have been omitted in this edition to avoid overlapping. The trade names section now contains 5,900 entries, and there is a complete list of contractors on the Roll of the National Inspection Council for Electrical Installation Contracting up to October last. The Directory is published by Benn Brothers, Ltd., Bouverie House, Fleet Street, London, E.C.4. The price remains at £3 3s, but this year a charge of 3s is made to cover the cost of packing and postage.

## Electrical Commercial Travellers

The North Western Branch of the Electrical Trades Commercial Travellers' Association held a general meeting on 10th March at the Waggon and Horses Hotel, Manchester, following which a talk was given on the benefits and advantages to be derived from membership of the British Commercial Travellers' Sick Benefit and Thrift Society by Mr. F. W. Mills and Mr. J. Vincent, president and general secretary, respectively, of the Society.

## Queensland Trade Delegation

The Queensland Promotion Delegation will be arriving in London on 8th April and will remain in the United Kingdom for a period of four weeks. While in this country it will visit the main industrial centres. The delegation, which is being led by the Queensland Deputy Premier and Minister for Labour and Industry (Mr. K. J. Morris, M.L.A.), will draw attention to Queensland industry and plans for future development, with a view to attracting British industry with ideas of overseas expansion. In addition it will survey the field of permits for manufacture in Queensland under licence.

The delegation is particularly anxious to contact as many industrial, banking and building representatives as possible. Interviews will be given throughout the United Kingdom by mutual arrangement. Any firm or organisation wishing to meet the delegation should write to the Agent-General for Queensland, 409 & 410, Strand, London, W.C.2.

*A caravan which L.E.S. Distributors, Ltd., has fitted out with Morphy-Richards appliances, and which has been touring the Home Counties in connection with the Morphy-Richards "Wedding Gift Parade" sales promotion scheme*

## R.E.C.M.F. Report

The report for 1957-58 presented at last Wednesday's annual meeting of the Radio and Electronic Component Manufacturers' Association shows that the past year was a successful one for the radio and electronic industry although towards the close of the year some of the capital equipment makers and their sub-contractors were affected by cuts in defence expenditure. New production records were achieved in most classes of components and present indications are that steady expansion will continue. Employment in the industry rose by 8 per cent despite the increasing introduction of automatic production methods.

The output of the radio and electronic industry in 1957 is estimated at over £260 million (an increase of about 13 per cent), of which 100 million represented "professional" equipment including defence, instrumentation, nucleonics, etc. Provisional figures for domestic production are:—Radio sets (including radio-gramophones) 1,800,000; television sets 1,800,000; and total units 8,000,000. Radio and electronic exports during 1957 were valued at £43·5 million, an increase of 7·5 per cent, the leading purchaser being the United States £4·5 million. The total value of exports of components and sound recording products was £20 million, 22 per cent higher than in 1956.

The report gives brief particulars of technical activities during the year.

## Structure of Electricity Supply Industry

In the chart showing the structure of the electricity supply industry in last week's issue the number of Districts in the North Eastern Area was given as 38. The Board points out that as a result of the merging of certain Districts there are now only 32.

## Trade Announcements

In order to facilitate efficient stores distribution in the London area, **Crompton Parkinson, Ltd.**, are opening an additional stores and trade counter for batteries, cables, lamps, lighting fittings and small motors at College Gardens, Edmonton, London, N.18 (telephone: Edmonton 7141). The new stores will serve all N., N.E., E. and N.W. postal areas, postal areas W.C.1 and E.C.1, Essex and North and North-West Middlesex.

**R. H. Cole (Overseas), Ltd.**, who are the sole agents for contact cooled selenium rectifiers made by Siemens & Halske, of Munich, Germany, inform us that their works will change-over the whole of their production to high temperature selenium rectifiers during the next few months. A further development concerns the manufacture of small silicon half-wave rectifiers, measuring approximately 7 mm diameter by 17 mm long. These are rated at 400 mA continuous capacitance load and are suitable for connection to 240 V r.m.s.

**Twickenham Transformers, Ltd.**, is now at 301, Richmond Road, Twickenham, Middx. (telephone: Popesgrove 9141).

**Bastian & Allen, Ltd.**, have moved their Midland Counties area office to 71, Broad Street, Birmingham, 15 (telephone: Midland 7995), and their Yorkshire and Lincoln area office to 22, Ullswater Road, Bennett Lane, Dewsbury, Yorks.

The business of **Editorial Services, Ltd.**, has been transferred to a new firm with the title of **C. S. Services.** The temporary address is 93, Baker Street, London, W.1 (telephone: Welbeck 0517-8-9).

## Change of Name

Coincident with the announcement that the Canadian subsidiary of George Kent, Ltd., Luton, has been awarded the contract for the instrumentation of units 1 and 2 for the Boundary Dam thermal generating station, Saskatchewan, we are informed that the name of this subsidiary company, previously Kent-Norlantic, Ltd., has been changed to George Kent (Canada), Ltd.

# GENERATION AND DEVELOPMENT

### *550 MW Turbo-Alternator*

It has just been announced that the Central Electricity Generating Board is placing an order for a 550 MW turbo-alternator with its associated condensing and feed heating plant with C. A. Parsons & Co., Ltd. The machine is believed to be the largest in the world to be ordered and is for the projected Thorpe Marsh generating station in Yorkshire. The operating steam conditions are 2,300 p.s.i. and 1,050 deg F with reheat to 1,050 deg F. The value of the contract will be approximately £5 million.

### *Pumped Storage Scheme*

Parliamentary approval of the North of Scotland Hydro-Electric Board's Awe project for Argyll will mean that Scotland's first hydro-electric station to rely entirely on pumped storage will be in service in the early 1960s. It will be timed to begin operating after the Hunterston nuclear power station is commissioned. Announcing this, the Board's general manager, Mr. A. A. Fulton, indicated that steps had also been taken to find a site for a nuclear station in the vicinity of Aberdeen or Dundee. This would go into production in the late 1960s, and surplus power would be delivered on appropriate terms to the South of Scotland Electricity Board.

The Awe constructional scheme, details of which were first given last year, will have a total installed capacity of 450 MW, of which the pumped storage unit will supply 400 MW. The estimated cost of the entire project is in the region of £24·5 million. The pumped storage installation will consist of a combined pumping and generating station on the shore of Loch Awe, together with a reservoir on Ben Cruschan at an elevation of 13,000ft. Station and reservoir will be connected by a series of vertical shafts. Surplus energy from Hunterston and the South of Scotland Board's large steam stations is to be supplied during the night hours and at weekends.

It is proposed to connect the Awe pumped storage scheme to the central grid at Windyhills, near Glasgow, by means of a 275 kV transmission line. Two overhead test spans were erected in 1957 near Dalmally in order to measure snow and wind pressures.

### *Street Lighting Column Design*

A model of the A.E.I. "Trifoil" spun concrete street-lighting column, designed by Mr. Jack Howe, F.R.I.B.A., F.S.I.A., was shown as an example of good current design in the B.B.C. television programme "Behind the Headlines" on 13th March, when the reaction of the public of new installations was discussed. Sir Gordon Russell, director of the Council of Industrial Design, and Mr. W. Robinson, E.D.A. lighting engineer, were among the speakers. Sir Gordon made the point that unless intended specifically for decoration, street-lighting columns should be designed to be as unobtrusive as compatibility with function would allow and that good design of the arms and lanterns was necessary if clashes with sky-lines and roof lines were to be avoided.

*A.E.I. "Trifoil" spun concrete lighting column at Cromwell Road Extension, London*

### *Chesterfield Station to be Closed*

Chesterfield generating station (installed capacity 5·5 MW) is to be closed down at the end of this month. An official of the Central Electricity Generating Board said that the station first started generating in 1901 and had never been stopped for a plant breakdown.

### *Eastern Board's New Rural Plans*

In ten years since nationalisation the Eastern Electricity Board has connected nearly 14,000 farms and more than four times as many other rural premises. This rapid progress means that the development remaining to be done is for isolated localities and remote premises often far distant from existing networks. This position was explained to the Consultative Council last week when proposals for a new system of rural connection charges designed to speed up the electrification of these more isolated areas were considered.

It was stated that the Board planned to connect about 3,500 farms and 12,500 other rural premises in the three years from 1st April next. This further programme would bring electrification in the area up to nearly 90 per cent in the case of farms and well over that figure for other rural premises.

The Council welcomed the Board's intention to pool the costs of the rural programme and spread the connection charges over all those who would benefit from these new supplies instead of, as previously, relating line rentals to the costs of each group or single extension.

Under the new scheme, simple scales had been fixed by the Board for each type of rural premises to be connected under the three-year programme. The rural connection charge would be related to the consumer's use of supply and its value to him in his business. For example, the farmer with a medium-sized farmhouse and 100 acres would be asked to pay £7 15s per quarter over seven years, or, if he preferred, a lump sum equivalent, less interest. One-third of this sum might be claimed by way of a grant under the Farm Improvement Scheme. The charge for a four-bedroomed house would be £1 7s per quarter, for a cottage £1 1s, and for a village shop with living accommodation about £2 2s.

Commenting on the new rural connection contributions, the chairman (Ald. W. J. Bennett) said the Council felt they were fair and reasonable. At the instance of the Council, the Board had agreed to waive the first quarterly charge or to reduce the lump sum payment for all consumers who signed up for the supplies before construction started on any scheme.

### *Scottish Board Directory*

The South of Scotland Electricity Board has issued a directory giving the names of the members of the Board, area managers and chief officers. The addresses of the district offices are given together with the names of the district engineers and district commercial engineers, the addresses of the service centres, and there is a list of generating stations showing the installed capacity and the names of the superintendents. Particulars are also given of the membership of the Electricity Consultative Council for the South of Scotland District. A map showing the Board's District and the eight areas is included.

### *Supergrid Link with Channel Cable*

The Central Electricity Generating Board announced last week that the proposed supergrid transmission line from Northfleet to Dungeness, linking with the cross-Channel cable, would be taken round Canterbury to avoid interference with the amenities of the city.

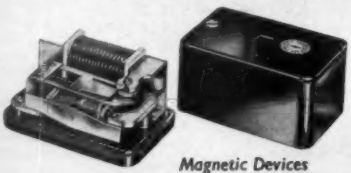
# NEW ELECTRICAL EQUIPMENT

## Table Lamp

A "contemporary" style table lamp, conical in shape, is the latest product of ROTAFLEX (GREAT BRITAIN), LTD., 4-10, Nile Street, London, N.1. It is based on one of the latest John and Sylvia Reid designs and is known as the "Geni Conifer." The shade is of washable "Rotaflex" material and is simply clipped on to a moulded circular baseplate enabling it to be easily removed for cleaning purposes. It is available in a range of four colours, i.e., red/candy, yellow/candy, white/candy and opal. The complete fitting measures 16½in high (base 16½in diameter) and it is designed for use with a 60 W lamp. The price, including flex, in-line switch and b.c. lampholder, is £1 12s 4d plus 6s 2d purchase tax in the United Kingdom.

## Motor Starting Relay

A relay produced as an alternative to a centrifugal switch for starting single-phase capacitor-start motors is announced by MAGNETIC DEVICES, LTD., Exning Road, Newmarket, Suffolk. The contact arrangement of



*Magnetic Devices motor relay*

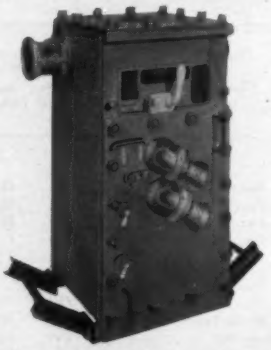
the Series 310 relay is single-pole normally closed. Operation is by a wide coil voltage differential. The relay winding is connected across the start winding of the motor and as the motor speed increases, the p.d. across the start winding and thus across the relay coil also increases, which causes the relay to operate and disconnect the start winding. The induced voltage in the start winding continues to energise the relay down to the stalling speed of the motor.

A three-terminal arrangement is standard but two spare terminals can be provided for making external connections. Base and cover are of high-grade phenolic mouldings.

## Mining Drill Transformer

A flameproof transformer for operating 125 V mining drills has been introduced by SIEMENS-SCHUCKERT (GREAT BRITAIN), LTD., Faraday Works, Great West Road, Brentford, Middlesex. The panel contains a 3½ kVA 3,300/125 V, three-phase transformer, star/star, with adjustable tappings on the h.v. side and is capable of operating two drilling machines on remote control.

The isolating chamber of the type DHT-4 panel is enlarged to accommodate a suitable 3·3 kV triple-pole isolator and fuses, the handle of this isolator being interlocked with the front cover. In the lower chamber the two low voltage circuits are each operated by a triple-pole automatic



*Siemens-Schuckert flameproof drill transformer*

circuit-breaker having time-lag thermal overload trips and instantaneous magnetic short circuit trips in each phase. The contactors for remote operation of the drilling machines are controlled by pilot relays, energised from a pilot transformer; the pilot circuits have been certified for intrinsic safety. Earth fault protection and testing facilities are provided.

## Transformer Plugs

A transformer unit which may be plugged directly into any three-pin, 5 A or 15 A (round pins) or 13 A (flat pin) socket outlet is announced by DOHM, LTD., 167, Victoria Street, London, S.W.1.

The "Electran" plug transforms mains voltage to 25 V, thereby giving a safe low voltage isolated output for inspection lamps, low voltage soldering irons, etc. The unit is obtainable in two standard sizes of 25 or 40 VA output. The transformer is double wound, with earthed screen and core, and is fully vacuum impregnated with solventless varnish.

Standard replaceable cartridge type fuses protect both primary and secondary circuits. The secondary

*Dohm "Electran" transformer plug*

connections are located remotely from the primary connections and consist of screw type terminals to facilitate easy wiring.

Access to terminals can only be achieved by complete removal of the transformer plug from the socket outlet. A cable grip is provided and the whole unit is completely enclosed in a thick hard grade oil-resisting rubber.

The plug measures 2½in by 2¾in by 2¼in. The price of the 25 VA unit is 69s 6d and the 40 VA unit costs 74s 6d.

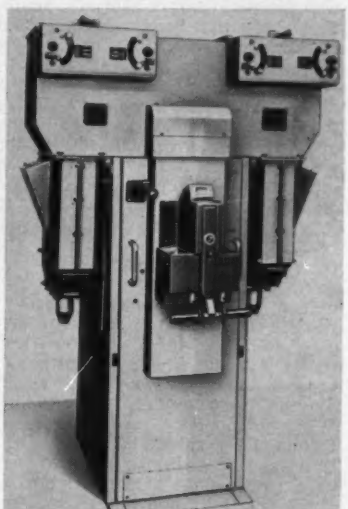
## Ring Main Unit

A type NX compound insulated ring main unit has been added to the range of switchgear of JOHNSON & PHILLIPS, LTD., Charlton, London, S.E.7. The unit comprises a standard metalclad oil circuit-breaker with two wing oil switches, the whole assembly being in one common structure. The unit has a 400 A normal current rating with load making, fault breaking (250 MVA at 11 kV) switches.

The oil switches have manual spring-operated mechanisms so that the opening and closing speed is independent of the operator. Each switch has separate blades for "main" and "earth" connections. Means are provided for inserting cable testing plugs through the top cover of the unit but access can only be obtained with the "earth" blades closed. The non-extensible unit is 6ft high by 3ft 9in wide and 4ft 4in deep.

A full complement of interlocks is fitted. The oil switch sections have been tested and certified to B.S. 2631 (K.E.M.A. Certificate No. 7810 : 1957) and the circuit-breakers are certified to B.S. 116.

*J. & P. type NX ring main unit*



***Financial Section***

# STOCKS and SHARES

INDUSTRIAL markets of the Stock Exchange have been unable to sustain the momentum of the recovery movement with which this month began, although the gains have been at least partly held. Wage negotiations have again come to the front as a factor in the investment outlook. Related to the signs of a continued shrinkage in the profit margins of industry, they would account for much of the disinclination of the investment community to change its wait-and-see attitude. The latter is encouraged also by indefinite news about the course of the American trade recession. Throughout the Stock Exchange the volume of business remains at a very low ebb.

## Price Changes

In the electrical markets, the tendency at the beginning of this week was reactionary, but much of the earlier improvement in share prices had been retained, or in some cases increased. English Electric gave up 1s 6d of the previous week's advance of 3s 9d, but Parsons and Reyrolle both put on more than 1s. Of others in the atomic power groups, Clarke Chapman recovered 5s of the earlier setback, and International Combustion went further ahead to 24s 6d. Cable manufacturers' shares became generally firmer in advance of the dividend declarations due over the coming weeks. B.I.C.C. and Enfield Cables were 6d better, and there were larger improvements in Telegraph Construction and L.E.W. Elsewhere there were improvements of note in S. Smith, Brook Motors, Berry's Electric and Hackbridge & Hewittic.

## Decca Prospects

At the annual meeting of Decca Record the chairman reviewed a period of progress in all branches during the year ended March, 1957. With eleven months of the next financial period already completed, he was able to forecast further expansion in the results for 1957–58. Output in the current year has already risen well above the previous figure of £17 million. Trading profits in 1956–57 reached the record figure of nearly £2·4 million. Mr. E. R. Lewis said that a marked increase on this would without doubt be shown in the results for the twelve months now ending. While gramophone records evidently account for a substantial share of the business, the chairman reported well of progress in the sections devoted to radio and television, radar and the Decca navigator. At 24s 6d the 4s "A" ordinary shares give a yield of over 7 per cent on the 43¾ per cent dividend.

## English Electric Dividend

At 49s 9d, English Electric £1 shares are showing a yield of 5·6 per cent on the 14 per cent dividend paid for 1957. At the company's annual meeting the latter was put in perspective by the chairman's observation that it represents no more than 5 per cent on the capital invested in the business, and also by his analysis of

## *Price Changes in*

| Company or Board | Nom. Value | Middle price 17th Mar. | Week's Rise or Fall | Dividend Previous | Dividend Last | Yield % £ s d | 1957 Highest | 1957 Lowest |
|---|---|---|---|---|---|---|---|---|
| *Gilt-edged Stocks* | | | | | | | | |
| Brit. Elec. 1968/73 ... ... | 100 | 72½ | −½ | 3 | 3 | 4 2 9 | 80 | 70 |
| Brit. Elec. 1974/77 ... ... | 100 | 70 | −½ | 3 | 3 | 4 5 9 | 78½ | 66 |
| Brit. Elec. 1976/79 ... ... | 100 | 74 | −½ | 3½ | 3½ | 4 14 6 | 81½ | 70 |
| Brit. Elec. 1974/79 ... ... | 100 | 83 | −½ | 4½ | 4½ | 5 2 6 | 92½ | 79½ |
| *Overseas Electric Supply* | | | | | | | | |
| Calcutta Elec. ... ... ... | £1 | 15/6 | | 6† | 6·8† | 8 15 6† | 19/- | 15/- |
| East African Power ... ... | £1 | 19/- | | 7 | 7½ | 7 18 0 | 21/- | 19/- |
| Nigerian Elec. ... ... ... | £1 | 15/6 | | 10 | 10 | 12 18 0 | 18/6 | 16/6 |
| Perak Hydro-Elec. ... ... | £1 | 14/6 | −6d | 10 | 12½ | 17 4 9 | 18/- | 13/3 |
| *Electrical Shares* | | | | | | | | |
| Aberdare Cables ... ... ... | 5/- | 10/9 | | 17½ | 17½ | 8 2 9 | 12/- | 9/9 |
| Aerialite ... ... ... ... | 1/- | 5/9 | | 48 | 51½ | 9 0 0 | 6/9 | 4/9 |
| Allen, W. H. ... ... ... | £1 | 33/6 | | 10 | 10 | 5 19 6 | 47/3 | 33/6 |
| Anglo-Portuguese Tel. ... ... | £1 | 20/9 | +6d | 8 | 8 | 7 14 3 | 27/6 | 20/6 |
| Aron Elec. Ord. ... ... ... | £1 | 54/- | | 15 | 15 | 5 11 0 | 60/- | 53/6 |
| Assoc. Elec. Ord. ... ... | £1 | 50/-x.d. | | 15 | 15 | 6 0 0 | 73/- | 48/9 |
| Automatic Tel. & El. ... ... | £1 | 60/6 | | 15 | 17 | 5 12 6 | 75/- | 54/6 |
| Babcock & Wilcox ... ... | £1 | 45/9 | | 15 | 13‡ | 5 13 6 | 82/6 | 54/9 |
| Bakelite ... ... ... ... | 10/- | 17/6 | +6d | 16 | 15 | 8 11 6 | 24/6 | 20/9 |
| Baldwin, H. J. ... ... ... | 2/- | 3/6 | | 20 | 20 | 11 8 6 | 5/- | 3/9 |
| Berry's Electric ... ... ... | 5/- | 6/3 | +3d | — | 10 | 8 0 0 | 6/6 | 5/6 |
| British Aluminium ... ... | £1 | 46/3 | +9d | 12 | 12 | 5 4 0 | 71/3 | 38/9 |
| Brit. Elec. Traction: Def. Ord. "A" ... ... | 5/- | 22/- | | 22½ | 25 | 5 13 9 | 25/- | 17/- |
| B.I. Callender's ... ... ... | £1 | 40/3 | +6d | 12½ | 12½ | 6 4 3 | 55/- | 39/6 |
| B.I. Callender's 6% Pref. ... | £1 | 20/- | | 6 | 6 | 6 0 0 | 21/9 | 19/- |
| British Tabulating ... ... | £1 | 40/- | | 9 | 10 | 5 0 0 | 56/3 | 37/6 |
| British Thermostat ... ... | 5/- | 23/9 | | 25 | 25 | 5 5 3 | 27/6 | 21/3 |
| British Vac. Cleaner ... ... | 5/- | 5/- | | 15 | 10 | 10 0 0 | 8/- | 5/- |
| Brook Motors ... ... ... | 10/- | 36/3 | +1/3 | 25 | 25 | 6 18 0 | 37/6 | 30/- |
| Bulgin, A. F. ... ... ... | 1/- | 5/6 | | 40 | 45 | 8 2 9 | 5/6 | 4/- |
| Burco Dean ... ... ... | 5/- | 7/9 | | 20 | 22½ | 9 13 6* | 9/4 | 5/10 |
| Cable & Wireless: Ord. ... ... ... | 5/- | 8/3x.r. | | 10 | 10‡* | 6 1 3 | 11/6 | 8/9 |
| 4% Loan ... ... ... | 100 | 93½ | | 4 | 4 | 4 5 6 | 92½ | 89 |
| Chloride El. Storage "A" ... | £1 | 58/9 | −1/3 | 17½ | 17½ | 5 19 3 | 68/9 | 55/9 |
| Clarke Chapman ... ... | £1 | 120/- | +5/- | 27½ | 27½ | 4 11 9 | 9 | 5½ |
| Cole, E. K.... ... ... | 5/- | 16/6x.d. | | 17½ | 17½ | 5 6 0 | 23/6 | 16/6 |
| Cossor, A. C. ... ... ... | 5/- | 4/6 | −3d | Nil | 2½ | 2 15 6 | 7/3 | 5/- |
| Crabtree ... ... ... ... | 10/- | 25/3 | | 20 | 20 | 7 18 6 | 26/- | 23/3 |
| Crompton Parkinson Ord. ... | 5/- | 9/- | | 16 | 16 | 5 18 6* | 11/9 | 9/3 |
| De La Rue ... ... ... | 5/- | 24/6 | +3d | 30 | 35 | 7 2 9 | 24/9 | 16/3 |
| Decca "A" ... ... ... | 4/- | 24/6 | −6d | 43½ | 43½ | 7 2 9 | 32/3 | 22/- |
| Desoutter ... ... ... ... | 5/- | 13/3 | −6d | 30 | 32½ | 6 2 9* | 17/9 | 13/9 |
| Dewhurst ... ... ... ... | 2/- | 7/- | | 16½ | 20 | 5 14 3 | 7/9 | 5/9 |
| Dictograph Tel. ... ... ... | 2/- | 5/3 | | 20 | 20* | 7 12 6 | 6/3 | 5/3 |
| Dubilier Condenser ... ... | 1/- | 3/3 | | 30 | 30 | — | 5/3 | 3/- |
| Duport ... ... ... ... | 5/- | 8/- | −3d | 25 | 25 | 7 16 3* | 10/6 | 8/6 |
| E.M.I. ... ... ... ... | 10/- | 30/3 | +3d | 15 | 15 | 4 19 3 | 36/- | 23/9 |
| Electrical Components ... ... | 5/- | 7/6 | | 25 | 12½* | 8 6 9 | 8/- | 6/6 |
| Elec. Construction ... ... | £1 | 21/3 | | 8½ | 8½ | 8 0 0 | 27/6 | 21/9 |
| Elliott-Automation ... ... | 5/- | 13/- | | — | 10‡ | 3 17 0 | 12/6 | 10/3 |
| Enfield Cable Ord. ... ... | £1 | 11/6 | +6d | Nil | Nil | Nil | 21/6 | 12/3 |
| English Electric ... ... ... | £1 | 49/9 | −1/6 | 14 | 14 | 5 12 6 | 65/- | 47/6 |
| English Electric 3½% Pref. ... | £1 | 12/3 | | 3½ | 3½ | 6 2 6 | 14/3 | 11/3 |
| Ericsson Tel. ... ... ... | 5/- | 18/6x.d. | +6d | 22† | 12†* | 3 4 9† | 25/- | 17/- |
| Ever Ready ... ... ... | 5/- | 14/3 | −6d | 35 | 37½ | 6 11 6* | 20/- | 14/- |
| Falk Stadelmann ... ... ... | £1 | 37/6 | | 17½ | 17½ | 9 6 9 | 40/6 | 35/- |

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

the group's turnover. Of every £100 about £48 went last year on materials, £33 on wages and salaries, £14 on depreciation, interest, etc., and over £2 on taxation. Of the remainder, £1·3 was retained in the business and net dividends accounted for scarcely more than £1. Points in Sir George Nelson's speech which attracted the market's attention included his statement that the improvement of the group's earnings last year was due wholly to the rise in turnover. Referring to the group's order book of £250 million, he said that he saw no great cause for anxiety about export business unless the American trade recession proved to be of long duration.

## *Electrical Investments*

| Company or Board | Nom. Value | Middle price 17th Mar. | Week's Rise or Fall | Dividend Previous | Dividend Last | Yield % £ s d | 1957 Highest | 1957 Lowest |
|---|---|---|---|---|---|---|---|---|
| *Electrical Shares—continued* | | | | | | | | |
| G.E.C. Ord. | £1 | 30/- | −9d | 14 | 12½ | — | 58/9 | 37/6 |
| G.E.C. 6½% Pref. | £1 | 20/6 | | 6½ | 6½ | 6 6 9 | 23/6 | 19/6 |
| General Cables | 5/- | 11/3 | | 30 | 24 | 10 13 3 | 15/6 | 11/6 |
| Greenwood & Batley | £1 | 47/3 | | 17½ | 17½ | 7 8 3 | 51/3 | 45/3 |
| Hackbridge Holdings | 5/- | 8/9 | | 30 | 20 | 11 8 6 | 21/9 | 11/3 |
| Hackbridge & Hewittic | 5/- | 11/- | +1/- | 23 | 20 | 9 1 9 | 16/- | 10/- |
| Head Wrightson | 5/- | 17/3 | | 20 | 22½ | — | 24/3 | 16/6 |
| Hestrae | 2/- | 4/3 | | 15 | 15 | 7 1 3 | 4/9 | 4/- |
| Henley's | 10/- | 12/3 | −3d | 11½ | 11½ | 9 7 9 | 17/- | 11/- |
| Holophane | 5/- | 13/- | | 30 | 37½ | 8 13 3* | 15/9 | 10/3 |
| Hoover | 5/- | 35/-x.d. | | 50 | 50 | 7 2 9 | 44/- | 24/9 |
| I.C.I. | £1 | 38/9 | −6d | 10 | 10 | 5 3 3 | 46/6 | 36/3 |
| Intl. Combustion | 5/- | 24/6 | +1/- | 22½ | 25 | 5 2 0 | 30/- | 19/3 |
| Johnson & Phillips | £1 | 16/3 | | 15 | 10 | 12 6 3 | 34/6 | 18/9 |
| Lancashire Dynamo | £1 | 31/3 | | 11 | 11 | 7 0 9 | 45/9 | 33/6 |
| Laurence, Scott | 5/- | 12/9 | | 15 | 15 | 5 17 9 | 19/9 | 13/9 |
| Lister, R. A. | £1 | 23/9 | −6d | 10 | 10 | 8 8 6 | 33/9 | 23/3 |
| London Elec. Wire | £1 | 41/3 | +1/3 | 12½ | 12½ | 6 1 3 | 53/9 | 40/9 |
| Lucas, J. | £1 | 32/6 | +6d | 7½ | 7½ | 4 12 3 | 36/6 | 27/6 |
| Marconi Marine | £1 | 32/- | +2/- | 10 | 10 | 6 5 0 | 37/- | 30/- |
| Marryat & Scott | 2/- | 10/3 | | 30 | 35 | 6 16 6 | 13/- | 8/- |
| Mather & Platt | £1 | 50/- | +1/3 | 15 | 15 | 6 0 0 | 63/9 | 47/- |
| Metal Industries | £1 | 27/6 | +1/- | Nil | 9 | 6 11 0 | 30/- | 20/3 |
| Midland Elec. Mfg. | £1 | 46/3x.d. | | 12½ | 12½ | 5 8 0 | 52/6 | 45/- |
| Morphy-Richards | 4/- | 15/-x.d. | +3d | 50 | 20* | 5 6 9 | 20/- | 11/6 |
| Murex | £1 | 53/9 | −6d | 20 | 20 | 7 8 9 | 79/6 | 58/3 |
| Newman Ind. | 2/- | 2/9 | | 10 | 10 | 7 5 6 | 2/11 | 2/1 |
| Oldham & Son | 1/- | 2/6 | | 17½ | 17½ | 7 0 0 | 3/- | 2/3 |
| Parnall (Yate) | 5/- | 6/3 | +3d | 12 | 12 | 9 12 0 | 8/9 | 5/9 |
| Parsons, C. A. | £1 | 48/- | +1/6 | 8½ | 7½*† | — | 71/3 | 45/- |
| Plessey | 10/- | 58/9 | | 30 | 30 | 5 2 3 | 86/3 | 60/- |
| Pye "A" Deferred | 5/- | 12/- | | 12½ | 12½ | 5 4 3 | 20/- | 12/- |
| Reyrolle | £1 | 77/6 | +1/3 | 16½ | 17½ | 4 10 3 | 110/- | 72/- |
| Rheostatic | 4/- | 6/6 | | 12½ | 12½ | 7 13 9 | 10/- | 7/- |
| Richardsons Westgarth | 10/- | 14/- | | 16½ | 16½ | 5 19 0* | 20/- | 13/6 |
| Scottish Cables | 4/- | 12/3 | | 27½ | 27½ | 8 19 6 | 19/3 | 13/3 |
| Simon-Carves | 5/- | 22/6 | | 28½ | 20* | 4 9 0 | 36/3 | 23/9 |
| Smith (England), S. | 4/- | 8/6 | +9d | 17½ | 20 | 4 14 3* | 8/- | 6/3 |
| Southern Areas | £1 | 10/- | −3d | 7½ | 7½ | 15 0 0 | 20/- | 11/3 |
| Strand Elec. | 5/- | 5/3 | | 15 | 15 | 14 5 9 | 8/- | 5/9 |
| Sturtevant | 5/- | 18/- | | 15† | 15† | 4 3 3† | 27/- | 17/9 |
| Sun Elec. | £1 | 47/6 | | 25 | 25 | 10 10 6 | 47/6 | 42/- |
| Switchgear & Cowans | 5/- | 10/3 | +3d | 25 | 25 | — | 15/6 | 9/6 |
| Taylor Tunnicliff | 5/- | 13/3x.d. | | 15 | 17½ | 6 12 6 | 13/9 | 11/9 |
| T.C.C. | 10/- | 37/6 | | 25 | 25 | 6 13 3 | 41/3 | 35/- |
| T.C. & M. | £1 | 23/- | +1/- | 8½ | 8½ | 7 7 9 | 31/- | 23/6 |
| Telephone Mfg. | 5/- | 4/6 | | 10 | 10 | 11 2 3 | 8/- | 5/3 |
| Telephone Rentals | 5/- | 10/6 | | 12½ | 12½ | 5 19 0 | 12/6 | 9/6 |
| Thompson (John) | 5/- | 25/- | | 25 | 25 | 5 0 0 | 37/- | 23/6 |
| Thorn Elec. | 5/- | 20/9 | | 15 | 17½ | 4 4 3 | 26/3 | 16/3 |
| Thornycroft | £1 | 22/6 | −9d | 12½ | 12½ | 11 2 3 | 37/6 | 21/3 |
| Tube Investments | £1 | 53/3 | +1/3 | 13¾ | 15 | 5 12 9 | 70/- | 51/3 |
| Vactric | 5/- | 14/6 | | 17½ | 25 | 8 12 6 | 23/9 | 12/9 |
| Veritys | 5/- | 5/3 | | 12½ | 12½ | 11 18 3 | 9/3 | 6/9 |
| Walsall Conduits | 4/- | 11/9 | | 20 | 20 | 6 16 3 | 15/- | 11/- |
| Ward & Goldstone | 5/- | 24/- | | 35 | 40 | 4 3 3* | 29/- | 18/6 |
| Watford | 2/- | 5/6 | | 25 | 25 | 9 1 9 | 6/9 | 5/9 |
| Westinghouse | £1 | 36/3 | | 18 | 10* | 5 10 3 | 41/3 | 28/9 |
| West, Allen | 5/- | 9/6 | | 15 | 15 | — | 13/6 | 9/6 |
| Wolf Electric | 5/- | 7/9 | | 20 | 20 | 6 9 0* | 13/9 | 8/9 |

### April Dividends

After the end of March the flow of company dividend declarations and financial statements on the results of the previous year gathers volume. If the dates of last year's announcements are repeated, the electrical market will hear much of interest in the first half of April. Among the most important will be the results of Automatic Telephone & Electric. B.I.C.C. and Johnson & Phillips will report on the outcome of what is thought to have been a difficult year in the cable industry. Of companies in the atomic power groups, Parsons, Reyrolle and Babcock & Wilcox are all due to make their announcements within a week or two, and news may be expected also from, among others, Lancashire Dynamo, Laurence Scott, Newman Industries and Watford Electric.

### Cable & Wireless Issues

Dealings are taking place in two new issues by Cable & Wireless (Holding), the first a free capitalisation issue, in the ratio of one new 5s share for every ten held, and the second a cash offer, in the proportion of one-for-five, at a price of 5s. The former, which qualify for all dividends for the current year, have been quoted at about 8s 3d; and the latter, which will miss the first quarterly distribution, at a premium of slightly over 3s. Discussing these issues at the recent annual meeting, Sir Edward Wilshaw said the directors thought that additional funds could be used profitably in furthering the business and with considerable investment advantage at this time. He was confident that, barring unforeseen events, it would be possible to maintain the present 10 per cent rate of dividend on the capital as increased by the two issues.

### Expansion

Investments of Cable & Wireless (Holding) are shown in the latest balance sheet at £15·7 million, of which £12·4 million was represented by quoted securities having a market value of £18·2 million at the end of last year. Income increased further to over £1½ million during 1957. As the chairman pointed out, this figure represented an expansion of 61 per cent in the past six years. In the same period, and allowing for the addition of £550,000 new capital, the sum invested had risen by over 6 per cent, and the value of the investments by more than 42 per cent. People who had held the shares since 1950 had seen their capital more than doubled, and an almost equal increase in their income. The newly issued shares are transferable, for the present, free of stamp duty and offer a prospective yield of a fraction over 6 per cent.

# REPORTS and DIVIDENDS

**The English Electric Co., Ltd.**—Sir George Nelson, Bt. (chairman), presided at the annual meeting held on 13th March, and in the course of his address said that the profit for the year under review was higher by £181,000, at £6·9 million, than for the preceding year. The financial results had been adversely affected by losses incurred by the Vulcan Foundry and Robert Stephenson Group in the United Kingdom and by the Canadian Marconi Co. in Canada. The former arose from the change-over of manufacturing capacity from steam to diesel-electric and electric locomotives and to diesel engines of English Electric design necessitated by the change in the principles of railway operation throughout the world. Both companies were short of work in steam locomotives in the early part of the year and the programme of British Railways modernisation had not developed sufficiently to replace this. The result was a loss by this group for the year of £286,000. The Canadian subsidiaries, the John Inglis Co., Ltd., and the English Electric Co. of Canada, showed a substantial improvement in 1957 resulting in a small profit, but Canadian Marconi had again experienced difficult market conditions and had made a substantial loss for the year. The Canadian companies' figures adversely affected the consolidated results for the year by £242,000, of which £110,000 was applicable to the parent company.

The improved results of the English Electric group were wholly due to a further increase in turnover made possible by additional manufacturing facilities provided from new capital and reserves and by improved operating efficiency.

Turning to the problem of inflation, Sir George said that improvements in design and production methods and the increase in the volume of business had enabled them to partly counteract the rise in wage levels, but they could not do so indefinitely and requests for higher wages where no equivalent increase in output or efficiency was possible must therefore be restrained. After paying tribute to the staff and workpeople in achieving improved efficiency, Sir George said that they looked to the Government, nationalised industries and industry generally to pursue efficiency with similar energy in the form of deeds and not words.

Dealing with research, he said that they had embarked upon the construction of greatly increased facilities at the Nelson Research Laboratories at Beacon Hill, near Stafford, and also at the mechanical and nuclear laboratories at Whetstone, where their scientists could concentrate still further upon fundamental research into long-term problems. At the same time the more immediate development work associated with their various products was carried forward at the development laboratories situated at each of their other specialised manufacturing centres. After referring to the need for increased production efficiency, Sir George mentioned the order placed with the English Electric Co. by the C.E.G.B. for two 275 MW turbo-generators for the Blyth "B" station.

The orders outstanding at the end of the year, for the group as a whole, exceeded £250 million, but this figure included for the first time the company's proportion of atomic power station plant and the substantial order for Canberra aircraft for India, which included a considerable volume of specialised equipment such as engines and electronic devices as part of the contract price. Of their total United Kingdom output, one-third went to overseas markets.

Referring to recession of activity in progress in the North American continent, Sir George said that so far as the English Electric was concerned there was as yet no evidence of a serious diminution in the rate of incoming orders, and as the situation was to-day, they had no great cause for anxiety. If the North American recession were to deepen, and to extend beyond the end of 1958, cause for anxiety might develop. Some initial corrective steps had been taken by the United States monetary authorities, and other anti-recession measures were still in reserve, and they might feel reasonably sure that towards the end of 1958 economic activity would show some recovery. Falling trade was not, however, solely a matter for North America. Commodity prices had been low for some two or three years, and, if continued, could materially impair the buying power of some of the traditional markets for the products of the company. To-day their knowledge of economic processes was such that they could reasonably hope that in twelve months, or not much more, the world would again emerge into a period of growing prosperity.

Sir George Nelson said that the constitution of the European Common Market made it important that some kind of European Free Trade Area should be created.

On the question of training and education he referred to the company's industrial fellowship scheme and its industrial scholarship scheme and said that they had never confined their educational and training facilities to young people in the United Kingdom; at the moment there were men from 33 different countries under training.

Reviewing the year's activities, Sir George referred to the part the company was playing in atomic power development, and mentioned that, in association with Babcock & Wilcox and Taylor Woodrow, they received last September the contract for the Hinkley Point station which would have an output of 500 MW. They had also received an order from the Admiralty for the design and manufacture of the steam propulsion machinery and the electric motors for the first British nuclear powered submarine, H.M.S. *Dreadnought*, in connection with which they were working with Vickers, Ltd.

Hydro-electric achievements of the year included the commissioning at Niagara Falls for the Hydro Electric Power Commission of Ontario of the first three of six of their reversible pump turbines. They had also received orders through the C.E.A. for 105,000 h.p. water turbines and ancillary equipment for the first large pumped storage scheme in this country at Blaenau Ffestiniog, North Wales.

Steam turbine generating plant included the first 100 MW set for Willington power station, which was commissioned during the year, and orders were received for two more 200 MW sets at High Marnham, making five sets of this size on order for this station. Another noteworthy contract from the C.E.A. was for a prototype air-cooled condensing plant for 120 MW turbines.

With regard to electric traction, in 1957 the British Railways, Southern Region, put into operation the first regular passenger service in Great Britain using diesel-electric trains, between London and Hastings, and all the units for this service incorporated English Electric equipment. The past year had seen the first major steps in Great Britain in railway electrification at single-phase 50 c/s frequency. The English Electric was fulfilling important contracts for electric locomotives and motor coach equipments in this new phase.

During the past year they had had in manufacture transformers for the Snowy Mountains project and the Kariba Gorge scheme and had also supplied two 200 MVA transformers to the Tennessee Valley Authority. One of the last installations of high-voltage airblast circuit-breakers to be commissioned in 1957 was a 275 kV, 7,500 MVA switching station for the supergrid at Rochdale. In the range of motors and control gear contracts completed during the year was included the main electrical equipment for the wind tunnel at the Royal Aircraft Establishment at Bedford.

Orders received for rolling mill drives were again a record for both home and export, the most important being that received from the South Durham Steel & Iron Co., Ltd. In the field of mining equipment, a 3,950 h.p. geared Ward-Leonard tower-mounted multi-rope friction winder was supplied for Maltby. The

order placed by Darlington Simpson Rolling Mills for a reversing rolling mill using mercury arc rectifiers in place of motor generator sets was a new departure in this field. Germanium rectifiers were now in large-scale production and a number of equipments were commissioned during the year.

A number of "DEUCE" computers had been delivered during the year, and they had also a large business in industrial and marine diesels, about 80 per cent of which went overseas. A considerable extension had taken place in domestic appliance activities. An improved washing machine introduced had met with marked success and production commenced on two new electric cookers incorporating many novel features and designs. A new refrigerator had been put into production which combined both large capacity with small external dimensions. New domestic products would appear during the course of the current year. After referring to aviation developments Sir George briefly reviewed the activities during the year of the associated and subsidiary companies.

**Marconi's Wireless Telegraph Co., Ltd.**—In his address to shareholders at the annual meeting held on 13th March, Sir George Nelson, Bt. (chairman), said that turnover for the year under review had been well maintained. Since the war there had been a remarkable growth in both the size and scope of their research activities in the fields of radio and electronics, and they had recently almost doubled the floor area of the Great Baddow laboratories. They had made great progress in the problem of microwave communication, including the "over the horizon" techniques known as tropospheric and ionospheric scatter.

In the nautical field the outstanding event of the year concerned the Doppler navigator and they had now designer a Doppler navigator for civil use. The radar division continued to make a vital contribution to national defence. On the Naval side, they continued to contribute substantially to the Admiralty development and production programme for shipborne radar equipment. During the past year more of their radio beacons had been bought, this time for installation off the coasts of South Africa, India and Formosa. A notable step forward in navigational radar for merchant and fishing fleets had been the introduction of the Marconi radar track indicator. For radio communications systems they had recently specialised in designing and installing entire multi-channel systems to serve complete territories, and their recent association with the Automatic Telephone & Electric Co., Ltd., in multi-channel communications was proving of great value. They had received large orders from several police forces for low-power radio telephone communication systems. The company was probably the largest exporter of capital television equipment in the world.

The range of instruments made by Marconi Instruments, Ltd., was enlarged year by year to meet requirements in all fields of electronic measurement, and well over a hundred different types of instruments were now available. In the electronics field, new engineering groups had been formed to work on nuclear reactor instrumentation, guided weapon test equipment and instruments for use with radio multi-channel link requirements. In hospitals and clinics, Marconi electro-medical and X-ray apparatus was helping to speed the progress of medicine.

**The Marconi International Marine Communication Co., Ltd.**—Another successful year's trading was reported by Sir George Nelson, Bt. (chairman), at the annual meeting held on 13th March. He said that in the field of radar the "Radiolocator IV" and the "Quo Vadis" continued to give satisfaction, especially when allied with the radar track indicator on which they were working at the time of the last annual meeting. This new equipment had met with an encouraging demand from the owners of vessels of all kinds. Of other navigation aids, the "Globespan" transmitter, introduced last year, was now available with increased power. V.h.f. was coming into increasing use in the maritime field for short-range communication, and they had introduced a new transmitter/receiver, the "Nautilus." Their ultrasonic anti-fouling equipment was coming into wider use on both British and foreign vessels.

For fishing vessels the "Fishgraph" recording echometer, with its associated "Fishscope" visual display and "Fishgong" aural device, had made a large contribution to the gratifying results. In the export market their progress during the year had been satisfactory.

**Charles Clifford, Ltd.**, report that after charging £72,503 for taxation, the group net profit for 1957 is £51,121, as compared with £65,291 for 1956. The proposed final dividend is 7 per cent, again making 10 per cent for the year.

**Courtney Pope, Ltd.**, has announced an interim dividend of 10 per cent. No interim payment was made last year, but the total for the year was 35 per cent, which included a 5 per cent jubilee bonus.

**George H. Scholes & Co., Ltd.**, state that the redemption of the 6 per cent redeemable cumulative preference shares at par (instead of at 22s) has resulted in £50,000 standing to the credit of the capital redemption reserve fund. The directors recommend that a further £35,000 be capitalised out of general reserve, and that the total of £85,000 be applied in making a bonus issue of 340,000 ordinary shares of 5s each on the basis of two new ordinary shares for every five shares held. Subject to resolutions being passed at an extraordinary meeting to be held on 2nd April to give effect to these proposals, the directors propose to pay an interim dividend of 6 per cent on the increased ordinary capital. This is the equivalent of 8·4 per cent on the present ordinary capital.

## New Companies

**Fairhurst Electronics, Ltd.**—Registered 3rd March. Capital £10,000. To enter into an agreement with J. Fairhurst and to carry on the business of precision engineers, etc. Directors: J. Redfern, J. Fairhurst, G. N. Ainsworth, R. J. Brunskill and Mary K. Fairhurst. Regd. office: 228/32, Corn Exchange Buildings, Hanging Ditch, Manchester, 4.

**Len Bowers, Ltd.**—Registered 28th February. Capital £2,000. Electrical engineers, etc. L. A. Bowers is permanent managing director. Regd. office: Rear of 87, Longfellow Road, Coventry.

**Chappell & Mitchell, Ltd.**—Registered 4th March. Capital £2,000. To acquire the business carried on by K. Chappell and A. T. Mitchell, as "Chappell and Mitchell" at 45, Arkwright Street, Nottingham, and to carry on the business of manufacturers of and dealers in radio, electrical and mechanical apparatus of all kinds, etc. Directors: K. Chappell and A. T. Mitchell. Regd. office: 18, Regent Street, Nottingham.

**Electronic Services (London), Ltd.**—Registered 4th March. Capital £500. Manufacturers of and wholesale and retail dealers in and agents for manufacturers of electronic, general electrical and other equipment and appliances, etc. R. Mallinson is the first director. Regd. office: 34, Market Parade, Rye Lane, Peckham, S.E.15.

## Liquidations

**Auto Electrix (Accessories), Ltd.**, retailers of motor car electrical accessories, 28, Station Road, Watford, Herts.—Winding up voluntarily. Liquidator, Mr. K. G. Winward, 28, Station Road, Watford, appointed 21st February. Particulars of claims by 24th March, to the liquidator.

**R. Bartlett (Electricals), Ltd.**, radio and television retailers, 168, Copenhagen Street, London, N.1.—Winding up voluntarily. Liquidator, Mr. N. W. Osborne, Bank Chambers, 1, John Street, Bedford Row, London, W.C.1, appointed 5th March.

**Reproducers (Electronic), Ltd.**, manufacturers, distributors and wholesalers of electrical equipment, 124, New Bond Street, London, W.1.—Last day for receiving proofs for dividend 21st March. Liquidator, Mr. H. J. Patience, 7, Deanery Street, London, W.1.

## Bankruptcies

**S. J. Barnes**, formerly carrying on business at 3, Pim Street, Antrim Road, Belfast, as an electrical contractor.—Receiving order made 28th February on debtor's own petition. Public examination 22nd May at the County Hall, Coventry.

**R. H. Ball**, 36, Whitefriars Road, Hastings, radio engineer, formerly residing at 12, The Parade, Leamington Spa, and carrying on business at Gordon Street, Leamington Spa, as a radio and electrical manufacturer.—Application for discharge to be heard on 18th April at the Shire Hall, Warwick.

**E. Newland**, electrical contractor, 130, Grove Road, Chadwell Heath, Romford, Essex.—Last day for receiving proofs for dividend 25th March. Trustee, Mr. D. A. Jacobs, 18, Bentinck Street, London, W.1.

**J. Summerly**, 93, Mowbray Road, South Shields, electrician.—Third and final dividend of 3¼d in the £, payable at the Official Receiver's office, Clarendon House, Clayton Street West, Newcastle-on-Tyne.

# NEW PATENTS

## Electrical Specifications Recently Published

*The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 26th March from the Patent Office, 25, Southampton Buildings, London, W.C.2*

**1954**

16235. General Electric Co., Ltd.—Electric supply sockets. 1st June, 1955. (792363.)

19025. Plessey Co., Ltd.—Transducers. 29th June, 1954. (792312.)

20110. Eldi-Feinmechanik Ges.—Electrical calculators. 9th July, 1954. (792342.)

20217. Sylvania Electric Products, Inc.—Electric discharge devices. 9th July, 1954. (792365.)

35935. Electric & Musical Industries, Ltd.—Magnetic recording and reproducing apparatus. 11th November, 1955. (792314.)

37788. Standard Telephones & Cables, Ltd.—Intelligence storage equipment. 31st December, 1954. (792294.)

**1955**

424. General Electric Co., Ltd.—Drying of cathode-ray tube screens. 6th January, 1956. (792539.)

1412. Plessey Co., Ltd.—Refractory materials. 22nd March, 1956. (Addition to 779128.) (792264.)

2993. General Electric Co.—Electric dish-washing apparatus. 1st February, 1955. (792566.)

3211. General Electric Co., Ltd.—Electric switching arrangements. 3rd February, 1956. (792303.)

4297. United Kingdom Atomic Energy Authority.—Trigger circuits. 1st February, 1956. (792504.)

4875. Power Frequency Heating, Ltd.—Combined engine heater and battery charger. 16th June, 1955. (792319.)

6321. General Electric Co., Ltd.—Electrical circuits including automatic switches. 1st March, 1956. (792505.)

7636. Chloride Electrical Storage Co., Ltd.—Alkaline type electric accumulators. 7th March, 1956. (792464.)

7833. General Electric Co., Ltd.—Electric heating elements and methods of making same. 19th March, 1956. (Cognate application 14398, 18th May, 1955.) (792265.)

9379. Chloride Electrical Storage Co., Ltd.—Alkaline type electric accumulators. 28th February, 1956. (792465.)

12464. Philco Corporation.—Method and apparatus for ageing or electroforming semi-conductor devices. 29th April, 1955. (792426.)

12974. British Thermostat Co., Ltd.—Snap-action electric switches. 1st August, 1956. (792295.)

15355. Westinghouse Electric International Co.—Electron discharge devices. 27th May, 1955. (792507.)

16619. Telephone Manufacturing Co., Ltd.—Electromagnetic relays. 4th June, 1956. (792270.)

16956. Prentice, Ltd.—Enclosed electric switches and switch units. 12th June, 1956. (792296.)

16969. British Thomson-Houston Co., Ltd.—Laminated magnetic cores. 9th May, 1956. (792474.)

17075. Birlec, Ltd.—Electric induction furnaces. 14th June, 1956. (792322.)

18186. United Kingdom Atomic Energy Authority.—Refinement of fissile metals. 18th June, 1956. (792347.)

18192. Plessey Co., Ltd.—Telephone systems. 19th June, 1956. (792475.)

18831. Fletcher, G. H.—Armature coils for dynamo-electric machines. 18th June, 1956. (792428.)

18980. Bendix Aviation Corporation.—Electronic oscillator. 30th June, 1955. (792510.)

21176. Metropolitan-Vickers Electrical Co., Ltd.—Starting circuits for electric motors. 20th July, 1956. (792497.)

22301. General Electric Co., Ltd.—Lever mechanisms and their application to motor control systems. 3rd August, 1956. (792452.)

22510. Elektrokemisk Aktieselskapet.—Methods and means for cleaning furnace gases from electrolytic furnaces. 4th August, 1955. (792249.)

23724. British Thomson-Houston Co., Ltd.—Cooling of magnetic cores. 17th August, 1956. (792477.)

23826. Amp, Inc., formerly Aircraft-Marine Products, Inc.—Electrical connections. 18th August, 1955. (792498.)

23964. Pye, Ltd.—Television receivers. 20th August, 1956. (792478.)

25232. Westinghouse Electric International Co.—Manufacture of tubular fluorescent lamps. 2nd September, 1955. (792515.)

25233. Marconi's Wireless Telegraph Co., Ltd.—Transmit-receive cells. 28th May, 1956. (792479.)

25342. Hermitte, R.—Primable electric batteries. 2nd September, 1955. (792297.)

25528. Western Electric Co., Inc.—Electric circuits including amplitude limiting semi-conductor devices. 6th September, 1955. (792418.)

25529. Western Electric Co., Inc.—Carrier telephone transmission systems. 6th September, 1955. (792419.)

26163. Buchanan Electrical Products Corporation.—Electric terminal block assembly. 13th September, 1955. (792298.)

26176. Western Electric Co., Inc.—Modulating circuits for carrier frequency signal transmission systems. 13th September, 1955. (792420.)

26898. General Electric Co., Ltd., and Hilbourne, R. A.—Direct coupled transistor amplifiers. 17th September, 1956. (792431.)

28787. English Electric Valve Co., Ltd.—Electric discharge tubes and other hermetically sealed devices incorporating glass-to-metal seals. 13th July, 1956. (792299.)

29604. Farber, Inc., S. W.—Electric cooking utensil. 17th October, 1955. (792453.)

30156. Philips Electrical Industries, Ltd.—Single-sideband radio receivers. 21st October, 1955. (792350.)

30940. British Thomson-Houston Co., Ltd.—Withdrawable electrical switchgear. 24th October, 1956. (792433.)

31117. General Electric Co., Ltd.—Doors for cooking ovens. 31st October, 1956. (792481.)

35459. Bendix Aviation Corporation.—Semi-conductor device. 9th December, 1955. (792275.)

35811. Preh, W., and Preh, A. (trading as Preh Elektrofeinmechanische Werke, J. Preh Nachfolger).—Potentiometers or variable resistors. 13th December, 1955. (792456.)

**1956**

876. Hughes Aircraft Co.—Microwave transducer. 10th January, 1956. (792387.)

984. Ateliers de Constructions Electriques de Charleroi.—Sound recording and reproducing apparatus. 11th January, 1956. (792435.)

1002. British Thermostat Co., Ltd.—Temperature and pressure responsive elements. 19th December, 1956. (792333.)

3578. National Cash Register Co.—Apparatus for effecting the transfer of data between the data storage unit of an electronic digital computer and an auxiliary data storage unit. 6th February, 1956. (792520.)

4867. Amp, Inc.—Insulated electrical connectors. 16th February, 1956. (792436.)

5016. Siemens & Halske Akt.-Ges.—Processes for the manufacture of multi-core telecommunication cables. 17th February, 1956. (792338.)

5873. Bendix Aviation Corporation.—Magnetic amplifiers. 24th February, 1956. (792391.)

6425. G.M.F. Electric Motors Pty., Ltd.—Lawn-mowing machines. 1st March, 1956. (792279.)

9367. Lindberg Engineering Co.—Electric heating furnaces and a method of heating such furnaces. 26th March, 1956. (792281.)

9823. Westinghouse Electric International Co.—Air break electric circuit interrupters. 29th March, 1956. (792359.)

9934. Philips Electrical Industries, Ltd.—Electric discharge tubes. 29th March, 1956. (792551.)

11561. Siemens-Schuckertwerke Akt.-Ges.—Methods and circuits for initiating electric discharges. 16th April, 1956. (792394.)

11681. Soc. de Construction d'Appareils Electro-Domestiques et Mensgers.—Vacuum cleaners. 17th April, 1956. (792524.)

14720. Philips Electrical Industries, Ltd.—Television camera tubes. 11th May, 1956. (792552.)

14745. Sperry Rand Corporation.—Signal amplifying and modulating apparatus. 11th May, 1956. (792526.)

15109. Philips Electrical Industries, Ltd.—Methods of making electrical connections to thin glass plates. 15th May, 1956. (792438.)

15490. Owens-Illinois Glass Co.—Electrical contact devices. 18th May, 1956. (792489.)

15882. National Research Council.—Radio frequency transformers. 23rd May, 1956. (792457.)

15947. Air Reduction Co.—Electric arc welding. 23rd May, 1956. (792439.)

16863. General Electric Co.—Sealing gaskets for cabinet doors. 31st May, 1956. (792440.)

18527. Compagnie Générale d'Electricité.—Device for testing unattended amplifiers to which power is supplied from a distance over the transmission line. 15th June, 1956. (792529.)

18978. Soc. d'Appareils de Controle et d'Equipement des Moteurs.—Variable speed electric generators in particular for automobile vehicles. 19th June, 1956. (792400.)

20126. Reichert, K.—Electric motor drives. 29th June, 1956. (792492.)

20567. Pirelli-General Cable Works, Ltd.—Devices for jointing oil-filled electric cables. 3rd July, 1956. (Addition to 783307.) (792491.)

21252. Soc. Anon. Française du Ferodo.—Electromagnetic clutches. 9th July, 1956. (792530.)

22037. Standard Telephones & Cables, Ltd.—Power cable terminations. 17th July, 1956. (792286.)

22409. General Electric Co.—Electrically insulating bushings. 19th July, 1956. (792460.)

26384. American Machine & Foundry Co.—Submersible dynamo-electric machine. 29th August, 1956. (792536.)

26416. General Electric Co.—Retaining ring structure for the conductor and windings of dynamo-electric machines. 29th August, 1956. (792494.)

30419. Forges et Ateliers de Constructions Electriques de Jeumont.—Electrical contactor and breaker cams. 5th October, 1956. (792405.)


### Technical Book Catalogue

The 1958 edition of the catalogue of technical books published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, is now available. These cover a wide variety of subjects including electrical engineering and radio and television.

Here at last is an all-purpose design for outdoor lighting that is both practical and elegant. The original lantern was chosen for lighting the new oil town of Kuwait in competition with British and foreign manufacturers. This successful design forms the basis of the Kuwait Unitary System which provides for every category of lighting from civic centres and main roads down to secondary roads and housing estates. The system is completely flexible and employs a high proportion of standardised and interchangeable parts and fittings. It makes possible completely harmonised lighting schemes on any scale; it covers every size and arrangement of outdoor lighting, and it allows for modification to suit changing conditions.

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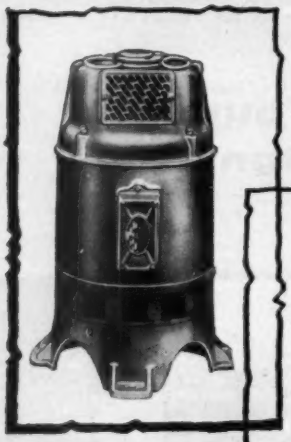

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N25

# NEXT WEEK'S EVENTS

*Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.*

### Monday, 24th March

BATH.—Bath Technical College, 6 p.m. I.E.E. Western Utilisation Group. "Brushless Variable Speed Induction Motors," by Professor F. C. Williams.

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Radio and Measurements Group. "Colour Television," by Ing. Dr. D. A. Maurice.

BRADFORD.—Technical College, 7.15 p.m. West Riding Federation of Engineering Societies. "Atomic Power Plants," by Dr. T. N. Marsham.

GLASGOW.—St. Enoch Hotel, 7.30 p.m. Institution of Works Managers, Glasgow Branch. "Isotopes," by Dr. H. Seligman. (Joint meeting with Glasgow Branch, Institution of Production Engineers.)

LEEDS.—Lighting Service Bureau, 24, Aire Street, 6.15 p.m. I.E.S. Leeds Centre. "Street Lighting in Leeds and Remote Control Systems," by K. J. Goddard and T. C. Holdsworth.

The University, 6.30 p.m. Institution of Production Engineers. "The Fabrication of Plastics," by Dr. V. E. Yarsley.

MANCHESTER.—Engineers' Club, 7 p.m. I.E.E. North-Western Graduate and Student Section. Annual Students' Lecture. "Man/Machine Relationships," by W. H. Dunkley.

NEWCASTLE-UPON-TYNE. — Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre. "The Design of a 330 kV Transmission System for Rhodesia," by F. C. Winfield, T. W. Wilcox and G. Lyon.

### Monday, 24th March, to Thursday, 27th March

LONDON.—Royal Horticultural Halls, S.W.1. Physical Society Exhibition of Scientific Instruments and Apparatus.

### Tuesday, 25th March, to Thursday, 27th March

LONDON.—1, Birdcage Walk, Westminster, S.W.1. Institution of Mechanical Engineers. Conference, "Technology of Engineering Manufacture."

### Tuesday, 25th March, to Saturday, 29th March

LONDON.—Earls Court. Electrical Engineers' Exhibition.

### Tuesday, 25th March

BRISTOL.—Grand Hotel, 7.15 p.m. Incorporated Plant Engineers, Western Branch. Annual general meeting.

CAMBRIDGE.—University Arms Hotel, 8 p.m. I.E.E. Cambridge Radio and Telecommunication Group. "Domestic High Fidelity Reproduction," by J. Moir.

CARDIFF.—Park Hotel, Park Place, 7 p.m. Ministry of Works, Cardiff Branch. "Nuclear Energy and Some Associated Problems," by W. L. Day.

EDINBURGH.—Scottish Lyceum Gallery and Restaurant, 11, Atholl Crescent, 7.30 p.m. Edinburgh Electrical Society. "Mining Electrical Equipment."

HULL.—Y.E.B. Ferensway, 6.30 p.m. I.E.S. Leeds Centre. Annual general meeting of Hull Section.

LEEDS.—C.E.G.B., 1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Education Discussion Circle. Discussion on "The Teaching of Electricity Supply," opened by G. Shepherd. (Joint meeting with the Graduate and Student Section.)

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. "The Atomic Clock," by Dr. L. Essen.

MANCHESTER.—Engineers' Club, 17, Albert Square, 6.15 p.m. I.E.E. North Western Measurement and Control Group. "Meters and Meter Engineers," by H. S. Petch.

NOTTINGHAM.—College of Arts and Crafts, 6.30 p.m. I.E.E. East Midland Centre. "Some Practical Considerations of Mine Electrification," by G. Rutter.

### Wednesday, 26th March

BIRMINGHAM.—Birmingham Exchange and Engineering Centre. Combustion Engineering Association, Midland Region. "Feedwater Systems and Ancillary Equipment," by C. G. Scolding (10.30 a.m.), and "The Effect of Coal Characteristics on the Operation of Mechanical Stokers," by G. G. Thurlow (2.30 p.m.).

CARDIFF. — University College of South Wales, 6.30 p.m. British Institution of Radio Engineers, South Wales Section. "Television Lighting Effects," by A. E. Robertson.

HOVE.—New Imperial Hotel, First Avenue, 7.30 p.m. A.S.E.E. Brighton, Hove and District Branch. "Automation," by I. McNeill.

LONDON.—2, Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "The Objective for Euratom," by Professor F. Giordani.

London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers. "Electronics in Medicine," by R. F. Farr.

MANCHESTER. — College of Technology, Sackville Street, 6.30 p.m. British Institution of Radio Engineers, North Western Section. "Electronic Handling Technique," by R. N. Settle.

The Central Library, 6.30 p.m. Manchester Metallurgical Society. "Some Metallurgical Aspects of Nuclear Power Development," by H. K. Hardy.

NOTTINGHAM.—East Midlands Electricity Board's Showroom Theatre, Smithy Row, 7.30 p.m. A.S.E.E. Nottingham Branch. "Using Electricity to Reduce Concrete Setting Time," by H. Twemlow.

PORTSMOUTH.—Southern Electricity Board Offices, Drayton, 6.30 p.m. I.E.E. Southern Centre. Joint meeting with the Graduate and Student Section. "System Control of the Electricity Grid," by J. Williamson.

RUGBY.—College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Graduate and Student Section. Annual general meeting and film evening.

### Thursday, 27th March

CHATHAM. — Medway College of Technology, 7 p.m. I.E.E. London Graduate and Student Section. District meeting. "The Application of Nuclear Energy to Power Production," by T. R. Puzey.

CROYDON.—Greyhound Hotel, High Street, 8 p.m. A.S.E.E. South London Branch. "The Safe Use of Electricity," by S. J. Emerson.

GLASGOW.—Royal College of Science and Technology, 7.30 p.m. I.E.E. Scottish Centre. Faraday Lecture on "The Electrification of the British Railways," prepared by the late G. H. Fletcher, delivered by R. Ledger.

HATFIELD. — Hatfield Technical College, 7 p.m. I.E.E. district meeting. "Electrical Synthesis of Music," by A. Douglas.

LONDON.—Dorchester Hotel, W. Electrical Wholesalers' Federation. Annual general meeting and (6.30 for 7 p.m.) annual dinner.

SHEFFIELD.—Grand Hotel, 7.30 p.m. Incorporated Plant Engineers, Sheffield and District Branch. Annual general meeting followed by films.

SPALDING. — Demonstration Room, E.M.E.B., 7.30 p.m. I.E.E. East Midland Centre. "Electrical Energy from the Wind," by E. W. Golding.

### Thursday, 27th March, and Friday, 28th March

LONDON.—2, Savoy Place, W.C.2. I.E.E. Radio and Telecommunication Section. Convention on Radio Aids to Aeronautical and Marine Navigation.

### Friday, 28th March

BARROW-IN-FURNESS. — Technical College, Abbey Road, 7.30 p.m. Institution of Production Engineers, North Western Region. "The Electronic Control of Machine Tools," by D. T. N. Williamson.

BIRMINGHAM.—Regent House, St. Phillip's Place, Colmore Row, 6 p.m. I.E.S. Birmingham Centre. "Lighting in Relation to Modern Ceilings and Roofs," by D. Phillips.

BRISTOL.—Hawthorns Hotel. I.E.S. Bath and Bristol Centre. Annual dinner dance.

CHELMSFORD. — Cromptons Social Hall. Chelmsford Engineering Society. Conversazione.

COVENTRY.—Craven Arms, 8.15 p.m. A.S.E.E. Coventry Branch. Films, "Electronics," and "Electronics in Industry."

HARROGATE.—Cairn Hydro Hotel, 7.30 for 8 p.m. I.E.E. North Midland Centre. Annual dinner-dance.

LIVERPOOL.—University of Liverpool, 7 p.m. Institute of Physics, Liverpool and North Wales Branch. "New Methods for Studying the Electronic Structure of Metals," by Dr. A. B. Pippard.

LONDON. — Connaught Rooms, W.C.2. British Refrigeration Association. 12.30 for 1 p.m., annual luncheon.

MALVERN. — Winter Gardens, 7 p.m. British Institution of Radio Engineers, South Midlands Section. "Transistors in Reception," by L. E. Jansson.

MANCHESTER. — Engineers' Club, Albert Square, 6.45 p.m. Plastics Institute, North Western Section. "The Use of Plastics in Electrical Cables," by J. D. S. Hinchcliffe.

NEWCASTLE-UPON-TYNE. — King's College, 6.30 p.m. I.E.E. North-Eastern Graduate and Student Section. "A Survey of Some Protection Schemes," by R. E. Scott and B. Yellowley.

OLDBURY.—Tube Investments Social Club, 8 p.m. E.I.B.A. Birmingham and District Branch. Annual ball.

STOKE-ON-TRENT. — North Staffordshire Hotel. E.I.B.A. North Staffordshire Branch. Buffet dance.

WEYMOUTH.—South Dorset Technical College, 6.30 p.m. I.E.E. Southern Centre. "Control of Nuclear Reactors," by R. J. Cox and J. Walker.

### Saturday, 29th March

LONDON.—A.S.E.E. North London Branch. Visit to National Physical Laboratory, Teddington (2 p.m.).

OXFORD.—A.S.E.E. Oxford, Reading and Districts Branch. Visit to Electrical Engineers' Exhibition, dinner party and theatre visit, London.

YORK.—A.S.E.E. York Branch, 10 a.m. Visit to the English Electric Co., Ltd., Bradford Works.

## Exhibition of Cardboard Tubes and Containers

The Rolex Paper Co., Ltd., Friendly House, 21-24, Chiswell Street, London, E.C.1, is holding an exhibition of its spirally wound cardboard tubes and cylindrical containers at its Slough factory during March/April. Large quantities of these are supplied to the electrical trade, but the company states that the end use to which they are put is not always apparent. It asks users, therefore, to co-operate by sending samples of their products, or alternatively drawings or photographs, to be incorporated in the display.

# CONTRACT INFORMATION

## Accepted Tenders and Prospective Electrical Work

### CONTRACTS OPEN

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses*

**Argentina.**—Water and Electricity Board, Buenos Aires. 29th July. Electromechanical machinery and equipment for Rio Hondo hydro-electric plant. (E.S.B. 6923/58. Ten/31489.)*

**Australia.**—Victorian Railways, Melbourne. 2nd April. Two 100 kVA transformers. (E.S.B. 7210/58. Ten/31522.)*

**Batley.**—Corporation. 1st April. Street lighting equipment. (See this issue.)

**Hampshire.**—County Council. Applications are invited for inclusion in a selected list of tenders for the supply of laboratory equipment for physics work and for electronics and servomechanisms equipment at Farnborough Technical College. (See this issue.)

**India.**—Director General of Supplies and Disposals, New Delhi. 9th April. Insulated cables. (E.S.B. 6612/58. Ten/31437.)*

Damodar Valley Corporation, Calcutta. 23rd April. Motor control centres for Durgapur power station. (See this issue.)

**Iraq.**—Central Foreign Purchase Committee, Ministry of Finance, Baghdad. 7th April. Two 10 kW a.c. generating sets. (E.S.B. 6237/58. Ten/31364.)*

**Korea.**—Government Office of Supply, Seoul. 3rd April. 161 kV oil circuit-breakers and line or disconnecting switches, Peterson coil, lightning arrestors, cable, tape, pumping units, etc. (E.S.B. 6648/58.I.C.A. Ten/31451.)* 30th April. Telephone equipment. (E.S.B. 6882/58.I.C.A. Ten/31475.)*

**Londonderry.**—Education Committee. 4th April. Electrical installation in the Limavady proposed new secondary intermediate school. County education architect, The Manor House, Coleraine.

**New Zealand.**—Christchurch City Council. 1st April. Insulated aerial cable. (E.S.B. 6953/58. Ten/31479.)*

**Pakistan.**—Deputy General of Supply and Development, Chittagong. 15th April. 11 kV and 6·6 kV switchgear. (E.S.B. 6428/58. Ten/31410.)*

**Rhodesia and Nyasaland.**—Tender Board, Causeway. 11th April. X-ray plant for Lusaka, Ndola, Broken Hill and Livingstone Hospitals. 18th April. X-ray plant for Luanshya Hospital. (E.S.B. 6412-3/58. Ten/31426-7.)*

**Rothwell.**—U.D.C. 10th April. Street lighting equipment. (See this issue.)

**South Africa.**—Durban Electricity Department. 28th March. 33 kV electric cables and joints. (E.S.B. 6350/58. Ten/31389.)*

Cape Province Administration. 8th April. 200 electric radiators. (E.S.B. 6452/58. Ten/31399.)*

Stores Department, South African Railways, Johannesburg. 9th April. Telephone material. (E.S.B. 6432/58. Ten/31404.)* Testing equipment for carrier systems. (E.S.B. 6433/58. Ten/31434.)*

**Tyrone.**—County Education Committee. 14th April. Electrical installation in Fivemiletown Secondary Intermediate School. J. McCandless, 6, Murray Street, Belfast.

### ORDERS PLACED

**Carlisle.**—City Council. Class "A" electric lighting cables on bus routes in the city (£20,466.)—B. L. Officer (Birtley).

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

**Durham.**—County Education Committee. Electrical work at Durham Technical College (£21,157).—North of England Engineering & Electrical Co.

**Farringdon (Berks).**—R.D.C. Re-wiring of 26 houses at Park Road and Marlborough Close (£1,080).—Cragg & Brewer.

**Middlesbrough.**—Corporation. Electrical work in connection with the provision of an art gallery in Linthorpe Road (£1,515).—Haigh & Ringrose.

### WORK IN PROSPECT

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors*

**Aylesbury.**—Houses (200), Quarrendon; borough engineer, Friarscroft, 3, Oxford Road.

**Ayr.**—Technical school; burgh surveyor.

**Banbury.**—Extensions to Banbury and North Oxfordshire Technical College (£110,000); county architect, County Hall, Oxford.

**Beverley.** — Physiotherapy department, Westwood Hospital; architect to Leeds Regional Hospital Board, Park Parade, Harrogate.

**Cheltenham.**—Bakery, Princess Elizabeth Way; British Bakeries (Western), Ltd., 5, Park Grove, Cardiff.

**Crawley.**—Houses (58); J. M. Austin-Smith & Partners, architects, 29, Sackville Street, London, W.1.

**Croydon.**—Four-storey block of 17 flats, Gatestone Road, Upper Norwood; borough engineer.

**Darlington.**—Additions to slaughterhouse (first stage) (£15,000); borough architect.

**Dudley.**—Flats (126), Wren's Nest Road; borough architect.

Bakery, Hall Street; Champion Bakers, Ltd., Parkway Road.

**Durham.**—Oriental Museum, Elvet Hill, for Durham University (£60,000); P. R. Middleton & Partners, architects, 17, Albert Road, Middlesbrough.

Fire station, Framwellgate Moor (£11,470); A. Watson, Ltd., builders, Front Street, Whickham.

**Ealing.**—Extensions and adaptations to County School for Boys (£80,995); Middlesex county architect, 1, Queen Anne's Gate Buildings, London, S.W.1.

**Edmonton.**—Factory, Claverings estate; Sterling Products, Ltd., Sterling Works, Leybourne Avenue, W.13.

**Enfield.**—Thirty three-storey flats, Churchbury Lane, and 24 flatlets (three-storey), Forty Hill; S. Ridgway, acting borough engineer, 7, Little Park Gardens.

**Gravesend.**—Secondary school; W. E. Fretwell & Partners, heating and electrical consultants, 117, High Street, Epsom.

**Hampshire.**—Stage 1 of technical college at Basingstoke and Stage III of technical college at Farnborough; county architect, The Castle, Winchester.

**Harlington.**—Hotel, New Road and Bath Road; Arthur S. Ash, architect, 66, Great Cumberland Place, London, W.1.

**Hereford.**—Showrooms and offices, 20/21, High Town; Stead & Simpson, Ltd., Belgrave Gate, Leicester.

**Ilford.**—Rebuilding on site in Ley Street, to form cinema, dance hall, etc.; T. P. Bennett & Sons, architects for scheme, 43, Bloomsbury Square, W.C.1.

**Ilkeston.**—Dwellings (73), Kirk Hallam estate; borough surveyor.

**Leeds.**—Shops (26), with dwellings over, at Armley, Brackenwood, Butcher Hill and New Carlton, and houses (42), Swinnow estate; city architect, Priestley House, Quarry Hill, 9.

**London.**—Flats, 103/105, Harley Street, Marylebone; C. E. Scrutton, Ltd., builders, 73, Beckton Road, E.16.

Offices, Wimpole Street, for General Dental Council; Marshall Andrew & Co., Ltd., builders, 31, Queen Anne's Gate, S.W.1.

Library, Hanley Road/Regina Road housing site, for Islington B.C.; O. Parratt, quantity surveyor, Adelaide House, London Bridge, E.C.4.

**Maidstone.**—Bank and offices, Middle Row; Sir Wm. Holford & Partners, architects, 2a, Angel Court, London, E.C.2.

**Margate.**—Police headquarters at Fort Hill; county architect, County Offices, Springfield, Maidstone.

**Middlesbrough.**—Boys' and girls' schools at Prissick Farm (£340,000); J. Miller & Partners, contractors, Wakefield, Yorkshire.

Houses (131), St. Hilda; James Miller & Partners.

**Newcastle-on-Tyne.**—Flats (44), Scrogg Road, etc., and twelve old people's houses near Wharrier Street; city architect, 18, Cloth Market.

School clinic and welfare centre, Kenton (£15,000); city architect.

**New Southgate.**—Flats (102), Palmers Road; David du R. Aberdeen, architect, 19, Southampton Place, London, W.C.1.

**North Shields.**—Boat-building factory; Gregson & Co., Ltd., 18, Creechurch Lane, London, E.C.3.

**Norwich.**—Administrative buildings and recreation hall at Little Plumstead Hospital (£112,460); Architects' Department, East Anglian Regional Hospital Board, 33, Parkside, Cambridge.

**Oxford.**—Slipper baths, Howard Street; city architect.

**Penrith.**—Factory for Gush & Dent, Ltd., Alresford, Hants.

**Peterborough.**—Flats (52) for old people, on Gunthorpe estate; city architect.

Further 50 houses on private estate at Werrington; Cecil Richardson Properties, Ltd., 17, Church Street, Werrington, Peterborough.

Houses (184), Westwood; Netherton Building & Construction Co., Ltd., Milton Street, Peterborough.

**Runcorn.**—Houses (148), slum clearance programme; U.D.C. surveyor, Town Hall.

**Sheffield.**—Dwellings (1,300) and 17 shops, as redevelopment of the Park Hill area, with provision for public buildings at a later date; J. Womersley, city architect.

**Smethwick.**—Aged persons' flats (40), near Spon Lane, and maisonnettes (14), Langley; E. L. Twycross, town clerk, Council House, Smethwick, 40.

**Southampton.**—Flats (60), Thornhill estate; Selleck, Nicholls & Co., Ltd., builders, East Hill, St. Austell.

**South Shields.**—Redevelopment scheme at Tyne Dock, with 200 new houses; John Reid, borough engineer.

**Torquay.**—Flats (36), Stitch Hill Road; S. J. Roberts, Spa Hotel.

**Truro.**—Kitchen and out-patients' and casualty departments at the Royal Cornwall Infirmary (£156,000); West Cornwall Hospital Management Committee; 4, St. Clement Vean, Truro.

**Uxbridge.**—Last instalment of grammar school, Hillingdon (£132,645); Middlesex county architect, 1, Queen Anne's Gate Buildings, S.W.1.

**West Hartlepool.**—Proposed St. Teresa's R.C. primary school; A. E. Gray & Son, builders, Chapel Street, Thornaby-on-Tees.

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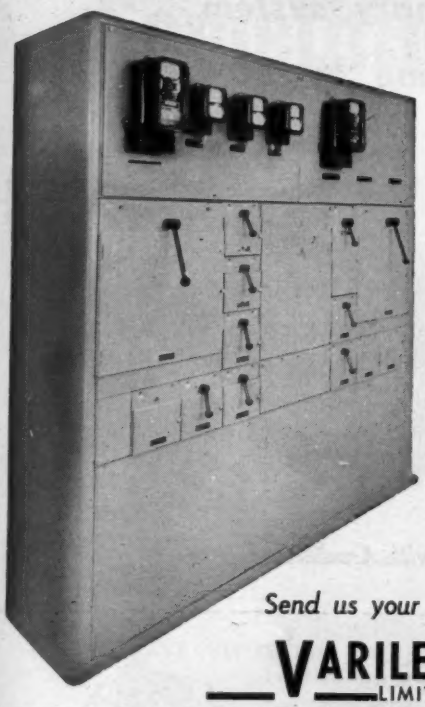

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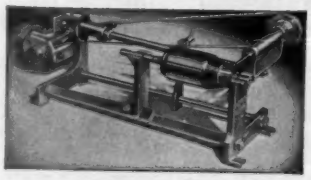

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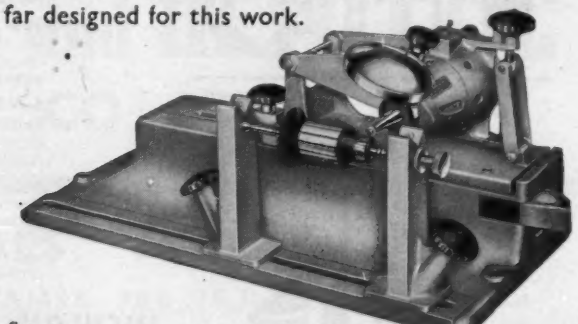

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## this revolutionary system cuts wiring time by 50%

**Just look at these features :—**

- Combines high speed fixing with simplicity.
- Makes wiring systems neater and more compact.
- Completely insulated and suitable for all climates.
- Simplifies wiring adjustments.
- Assured electrical and mechanical security in all conditions.
- Substantially reduces wiring costs.

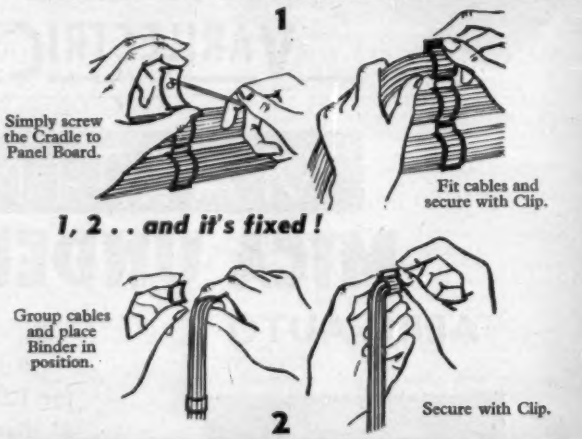
## *Twice as good . . . twice as quick . . . when you wire with Cradleclip !*

More and more progressive Companies are switching to Cradleclip...No wonder, when you consider the remarkable versatility and proved economy of the Cradleclip system. Two simple movements and Cradleclip is truly fixed, quickly, efficiently and neatly! Cradleclip, whilst being extremely simple in operation, sacrifices no point of technical efficiency and is suitable for service in all climatic conditions with a temperature range of −60° C to +100° C. Cradleclip is another Insuloid contribution to progress in electrical industry. We would be pleased to send you fully descriptive literature telling you all about the Cradleclip revolutionary wiring system on request.

**And such simple components !**

The Cradleclip system is compact from every viewpoint and consists of only 3 main components which are supplied in a range of sizes which provides for multi-purpose interchangeability. The illustrations below show how simply the components are used.

*Insuloid products for greater cable fixing efficiency.*


1
Simply screw the Cradle to Panel Board.
Fit cables and secure with Clip.
1, 2 . . and it's fixed !
Group cables and place Binder in position.
Secure with Clip.
2

*find out about these other INSULOID products :-*

**A.S. Saddles**
For time saving and greater efficiency in Wallmounted wiring.

**S.A.S. Saddles**
Single screw 2 point fixing for use in conjunction with standard cable racking.

**Flexiguard Cable Trunking**
Developed for cubicle-to-door wiring protection and speed of installation. Simple to fix and an obvious aid to wiring problems.

**Ringlock Bush**
A snap action, quick locking bush that will not come out after fixing. Simple finger action, instantaneous assembly for complete security in service.

**NX, X & CY Clips**
The well-known Insuloid range of Cable clips in nylon and P.V.C. For long service, anti-corrosive, non-chafing and very economical.

**Busbar Insulation**
Shrunk-on hard plastic sleeving brings immediate savings in cost, time and production with increased efficiency and safety. Provides permanent dielectric non-ageing and "non-tracking" protection.

## INSULOID MANUFACTURING CO. LIMITED

Sharston Works, Leastone Road, Wythenshawe, Manchester.
Tel : Wythenshawe 2842 & 3163.

# Something to see...

*...on the Hackbridge and Hewittic Stand 02 at the A.S.E.E. Exhibition, Earls Court, March 25th to March 29th*

- ★ **HEAVY DUTY RECTIFIER UNIT** *employing cooled cathode type bulbs*
- ★ **HEWITTIC GERMANIUM RECTIFIER CELLS**
- ★ **RECTIFIER REVERSING DRIVE**
- ★ **HEWITTIC-METALECTRIC** *working model high frequency induction furnace equipment*
- ★ **SELENIUM RECTIFIER EQUIPMENT**
- ★ **TRANSFORMER EQUIPMENT** *including a 1000kVA class C unit*
- ★ **ON-LOAD TAP CHANGING GEAR**
- ★ **H.V. OUTDOOR OVERHEAD LINE SWITCHGEAR**

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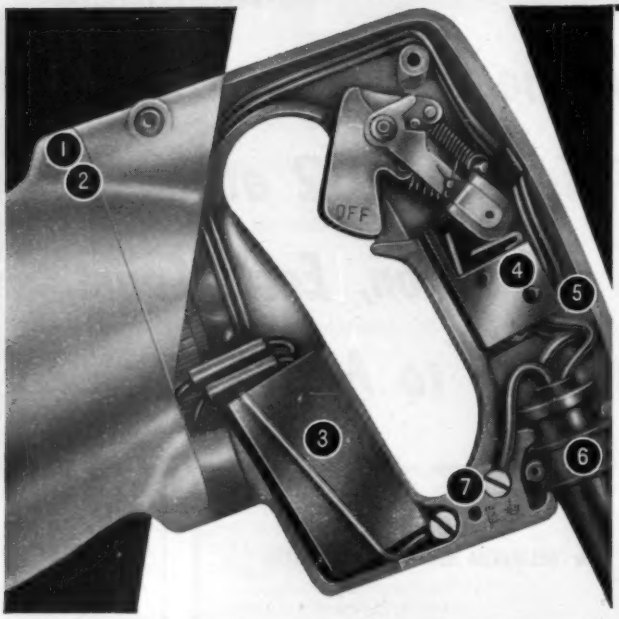
**TELEPHONE: WALTON-ON-THAMES 760 (8 lines)**

STAND TELEPHONE: FULHAM 5836

# Wolf TOOLS LEAD THE WAY

WITH NEW *Exclusive* FOOLPROOF PROTECTION

Wolf 3/8" DRILL
TYPE WD3c




1 RECESSED BRUSH CAPS WITH CIRCLIPS

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The Suppressor—an optional accessory—conforms to BSS 6138 & 800

4 SWITCH UNIT MOUNTED ON INSULATING MATERIAL

5 PERMANENTLY MOULDED INSULATION LINER
In casing and cover (Wolf Patent No. 745544)

6 SECURE ANCHORAGE OF CABLES

7 PROTECTED INTERNAL EARTH WITH INTERNATIONAL MARKING

★ ALL WOLF TOOLS FULLY COMPLY WITH BSS 2769

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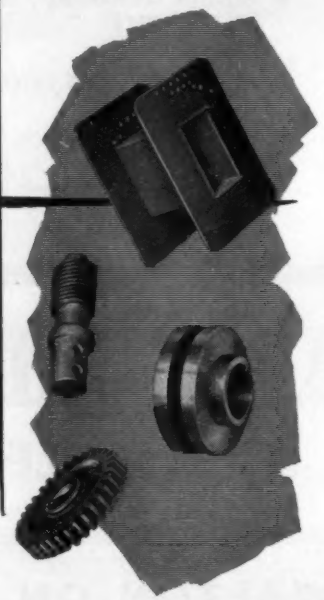

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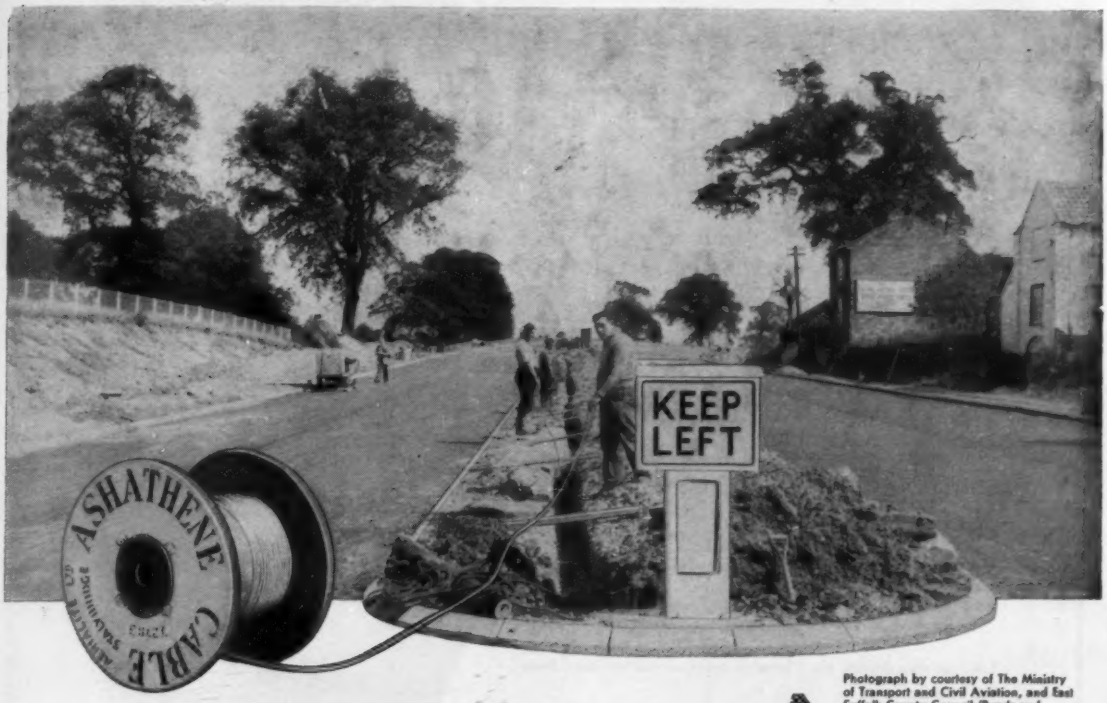


Photograph by courtesy of The Ministry of Transport and Civil Aviation, and East Suffolk County Council (Roads and Bridges Dept.)

# ASHATHENE *on the Highway*

Chosen to supply the "Keep Left" signs on the important Highway A12,

## AERIALITE ARMOURED ASHATHENE CABLES

are being installed on the Washbrook section of the Colchester/Ipswich dual carriageway by the contractors May, Gurney & Co. Ltd.

Ashathene P.V.C. sheathed and armoured cables have the widest application in industry, in mines and for general purposes where toughness, strength and reliability are of major importance.

These cables are supplied with polythene or P.V.C. insulation, with single or double wire armour and conform to B.S.1557 or B.S.2004 (as far as applicable).

Full details on request.

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Head Office and Cable Division: Castle Works, Stalybridge. Tel.: Stalybridge 2223/8.

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# FOR THE FIRST TIME

## a HEATED Spin Dryer..

## greatest development since spin drying began

Like all spin dryers, the Thermair spins excess moisture from the washing.

Unlike other spin dryers, the Thermair also circulates heated air through the washing. It dries it ready for ironing—or ready for use if desired.

First with heat, the Thermair sets the pattern for spin dryers of the future. To get clothes really dry you need a Thermair.

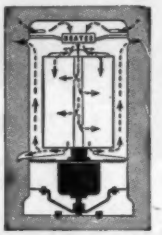
The Thermair is quiet and stable, because of an entirely new principle—gyroscopic centring. It's capacious, because you can fill it to the top, packing in about 25% more washing than with most. It's safe, because the clothes are totally enclosed and the spinner automatically brakes when the lid is raised.

*The British-made Thermair, retailing at 43 guineas, including Purchase Tax, is going to mean big business for you. You may tell housewives that they can pick the rainiest day to do their washing—that the Thermair brings sunshine and a good drying breeze right into the kitchen, whatever the weather.*

*No more wringing, no more broken buttons, no more pegging out, no more weather worries. That, you'll agree, is a good 43 guineas worth. The first spin dryer with heat is going to sweep the market. May we suggest you send for more details before the demand builds up ?*

# Thermair

## *FIRST WITH HEAT* SPIN DRYER

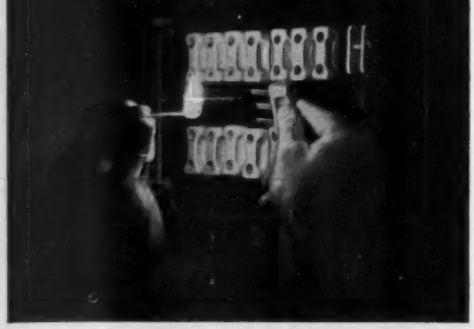



**See how the air is first warmed, then circulated through the spinning clothes to make them really dry.**

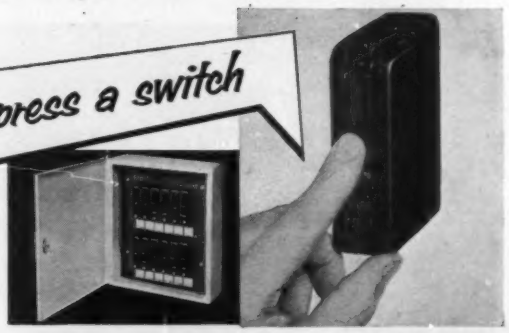
*(Patents applied for).*

**MANUFACTURED BY THERMAIR DOMESTIC APPLIANCES LIMITED**
**Sole Distributors : THE BRATTEL ELECTRIC CO. LIMITED, ARCADE HOUSE, 27 OLD BOND STREET, LONDON, W.1**
**TELEPHONE : HYDE PARK 8978/0 (3 LINES)**

# Why repair a fuse?



*just press a switch*



*We cordially invite you to visit us at our*

**STAND No. N10**

**Siemens-Schuckert (Great Britain) Ltd**

**THE S.141 PLUG-IN MINIATURE CIRCUIT BREAKER**

—the simplest, quickest, most effective method of restoring a circuit. When the circuit is overloaded, the switch automatically snaps off, instead of the fuse blowing—thus breaking the circuit and preventing damage. The Circuit Breaker takes the place of the fuse. Providing the overload is temporary, it is only necessary to switch on again to restore the circuit. That's all there is to do, and only a repetition of overload or fault will re-break the circuit.

The Breaker itself consists of a unit which contains the switch, and a socket which is fixed to the wall. Breakers are available in various current ratings and it is a simple matter to alter circuit loading if necessary, by plugging the unit of appropriate amperage into the required socket.

The S.141 is ideal for use in hospitals, offices, theatres, factories; and it is also suitable for private housing estates and flat projects. Ratings up to 30 amps. 250 volts AC/DC.

*Send for full details and illustrated leaflets of the S.141 Circuit Breaker.*

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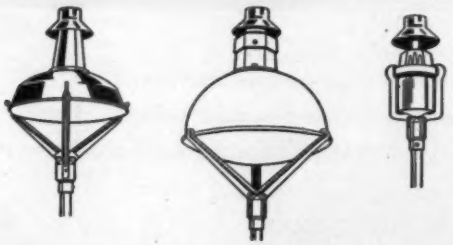
Smee's S.90

School Keeper servicing fittings at 20 feet

*Photo by courtesy London County Council*



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**"DETACHABLE SUSPENSION"**

for HIGH PLACED LAMPS and FITTINGS by

***No-Climb System***

NO LADDERS REQUIRED

**ONE MAN SERVICING BY RESIDENT STAFF**
**TIME SAVED IS ENORMOUS**
**HIGH SAFETY FACTOR**
**REACHES FITTINGS 20 ft. - LAMPS 25 ft.**

***Especially useful for the following installations:***

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**CABLE STRIPPERS LTD.**

**Leighton House, Potters Bar, Middlesex, England**
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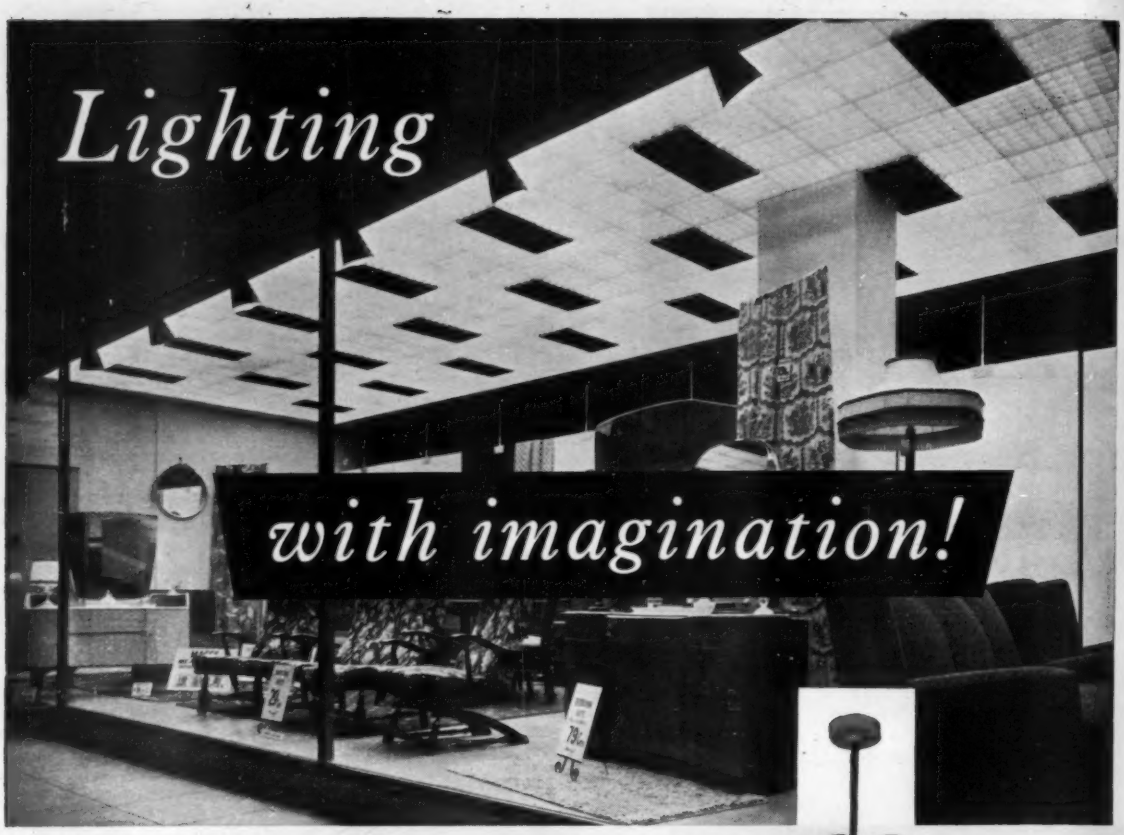
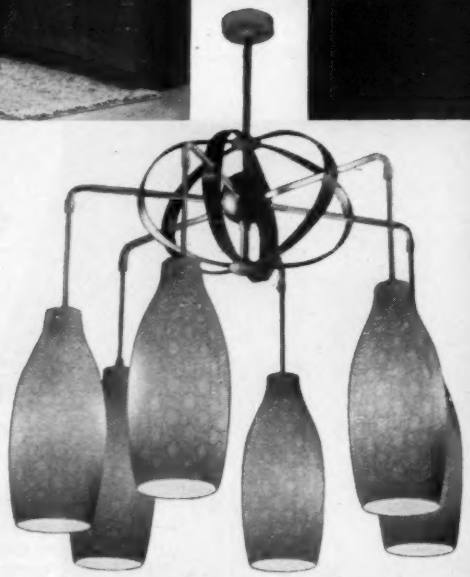
*Export enquiries to*

**J. M. WOTHERSPOON & CO. LTD., 194-200 Bishopsgate, London, E.C.2**




Here is louvering with a difference. The advantages of Luve-tile panels are already well known, painting some areas black has lifted an ordinary scheme into the realm of design.
Harris and Sheldon Electrical delight in just such special jobs. The picture on the right shows their imaginative approach to a very popular type of glassware—this fitting, designed by Robert Tate, is only one of the wide Handslite range.



# Luve·tile

THE BEST OF BOTH WORLDS

HANDSLITE

**HARRIS & SHELDON (ELECTRICAL) LTD.**
RYDER STREET, BIRMINGHAM 4. Telephone: CENtral 6272
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*Complete Lighting Specialists and Manufacturers of Lighting Fittings and Control Gear*

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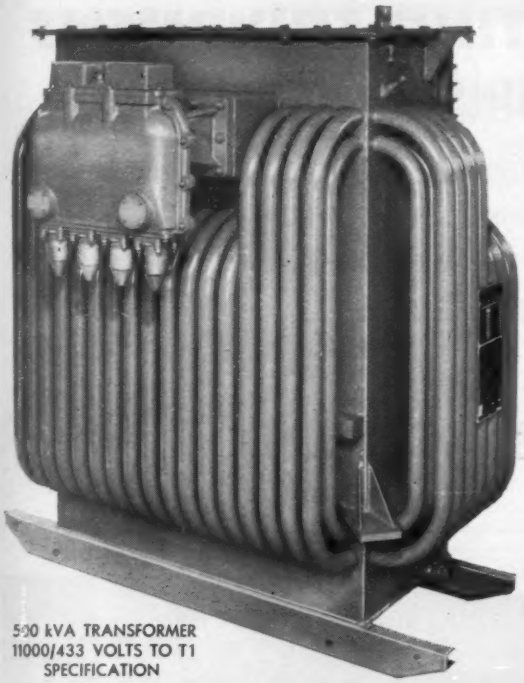
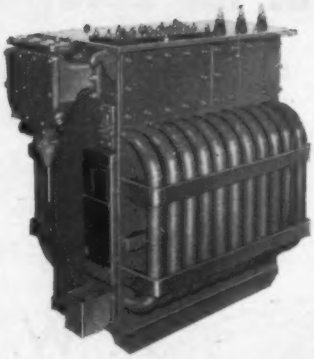


500 kVA TRANSFORMER 11000/433 VOLTS TO T1 SPECIFICATION



45 kVA TRANSFORMER FOR FEEDING GERMANIUM RECTIFIER

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EXCELLENT WORKMANSHIP
ABSOLUTE RELIABILITY
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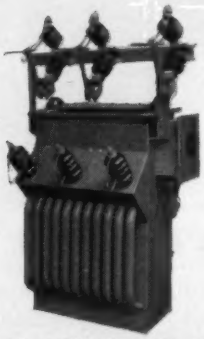
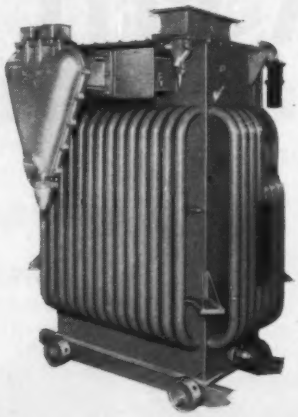


50 kVA 6600/400 VOLTS POLE MOUNTING UNIT WITH H.T. ISOLATOR, L.T. FUSES AND CABLE BOX



250 kVA 3300/433 VOLT UNIT WITH NEUTRAL CURRENT TRANSFORMER IN TANK INTERLOCKED WITH TANK COVER

*Consult—*

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***SEE*** – A comprehensive range of CONTROL GEAR

***SEE*** – STAND R4 – FIRST FLOOR

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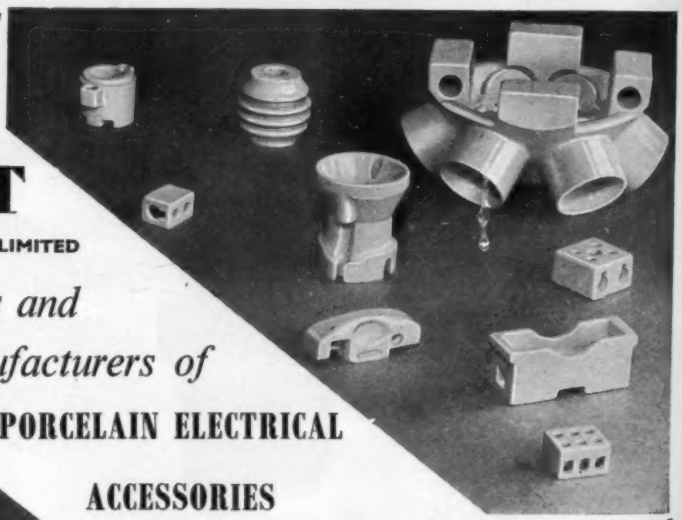

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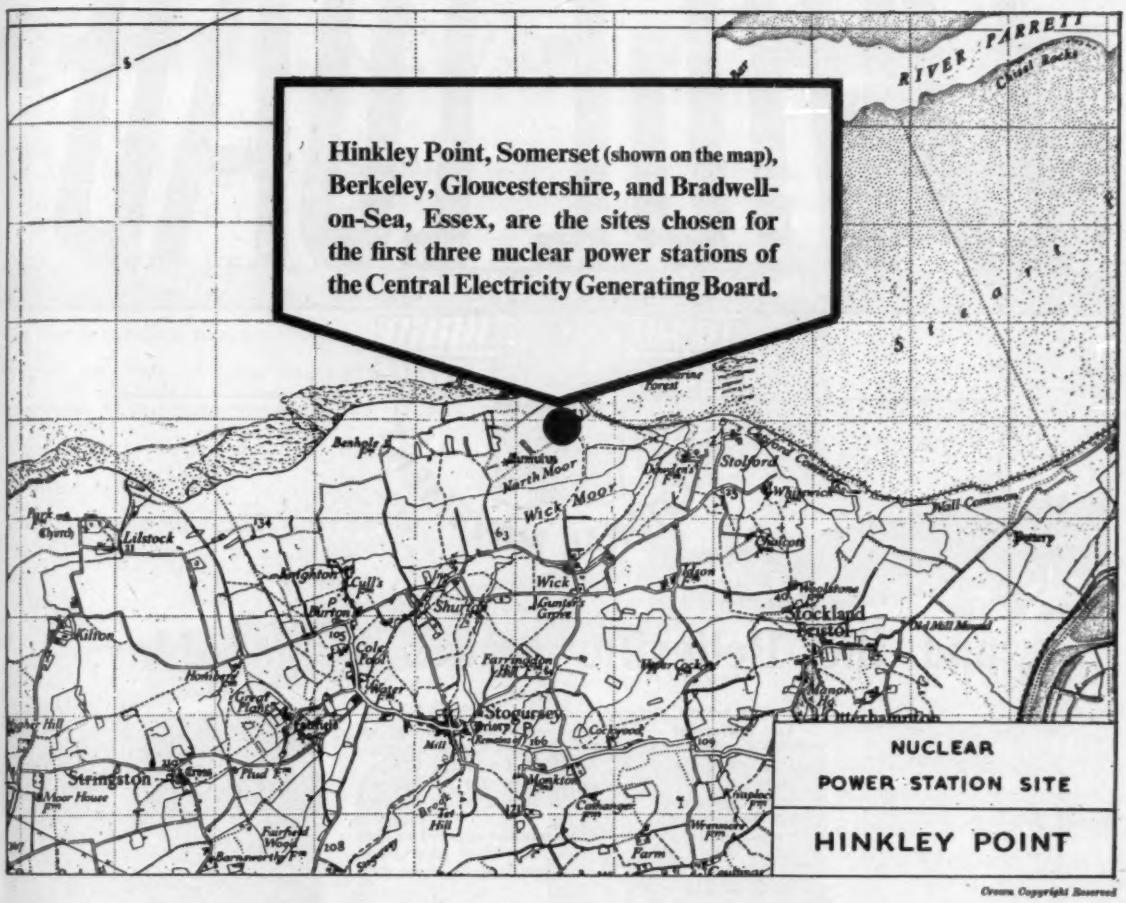
# Electricity from Nuclear Energy

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## The growing need for power

As Britain's industrial efficiency increases, so does the need for power. The demand for power doubles every ten years. The electricity supply industry has already met the doubled demand since 1st April, 1948, and has made provision for a similar expansion in the next decade.

Work on the first two nuclear power stations, at Berkeley in Gloucestershire and Bradwell in Essex, was started in January, 1957, and on the third in England, at Hinkley Point in Somerset, last September. These three stations will have an aggregate of some 850,000 kilowatts.

The Government's revised nuclear power station programme provides for enough nuclear power stations to be completed in the next decade to provide 5-6 million kilowatts of generating capacity. Provision is also being made for the construction of new main transmission lines.

**As the demand for power grows, nuclear energy will become more and more important as a source of electric power, upon which the economic future of the country so largely depends.**

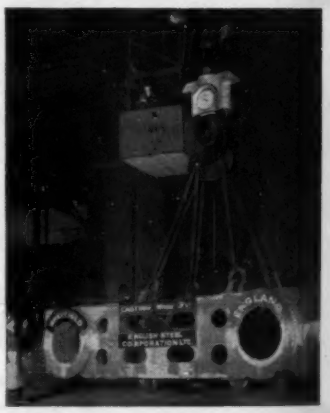
THE CENTRAL ELECTRICITY GENERATING BOARD

# LARGE LOAD

## . . . and the Belleville makes it possible . . . !

The largest capacity spring balance in the world. This instrument was made to weigh giant steel castings and is graduated up to 200 tons with 1 ton sub-divisions. It is approved by the Board of Trade for "Trade" purposes, where the requirement is that the machine must be accurate to within a quarter of its smallest sub-division.

Two Belleville washers, in this instance opposed to each other, supply the spring resistant. Their total movement under full load of 200 tons is never more than $\frac{1}{16}$ of an inch.



# SALTER...

*...always a spring ahead!*

★ When resistance to load or thrust is beyond the capacity of helical springs,

★ When take-up of shock or sustained load must be restricted to very slight movement,

★ When many tons of dead load must be sustained plus intermittent shock or live load . .

***. . . it's time to call in SALTER technicians!***

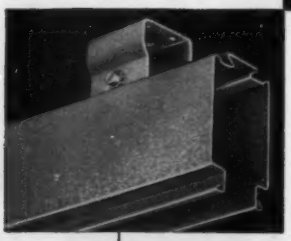
GEO. SALTER & CO. LTD., WEST BROMWICH, ENGLAND . ESTABLISHED 1760

*Now* **Really quick to install. Strong, simple. Virtually tighten only on site.**

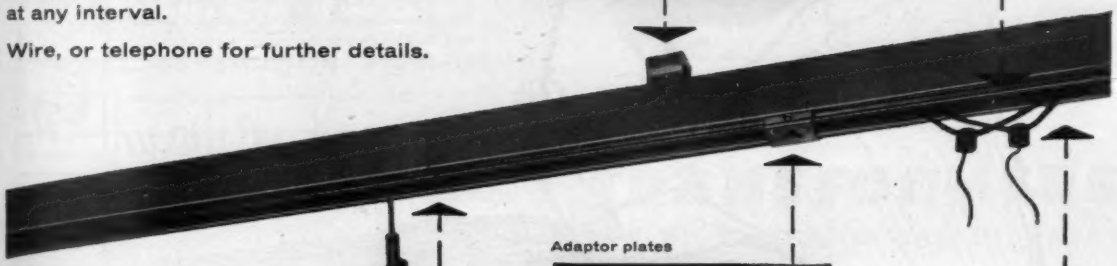
# Crompton 'NEW-LINE' trunking system

Here are some of the unique features:
Self-aligning coupling piece.
No tapped holes to find.
Slip-in or snap-on fixtures. Takes any type of lighting fitting—filament, fluorescent or discharge—at any interval.
Wire, or telephone for further details.

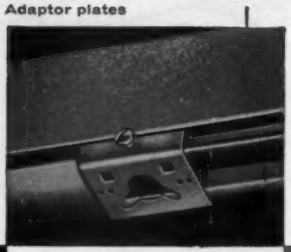
Line tap 'take-off'



Channel section and suspension stirrup

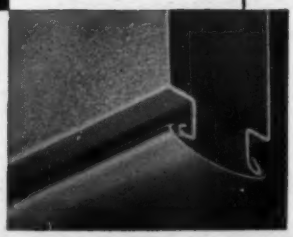


Adaptor plates



Internal coupling

Plastic cover strip



ELECTRICAL EQUIPMENT

**Crompton Parkinson** LIMITED

BY APPOINTMENT TO HER MAJESTY THE QUEEN MANUFACTURERS OF ELECTRIC LAMPS

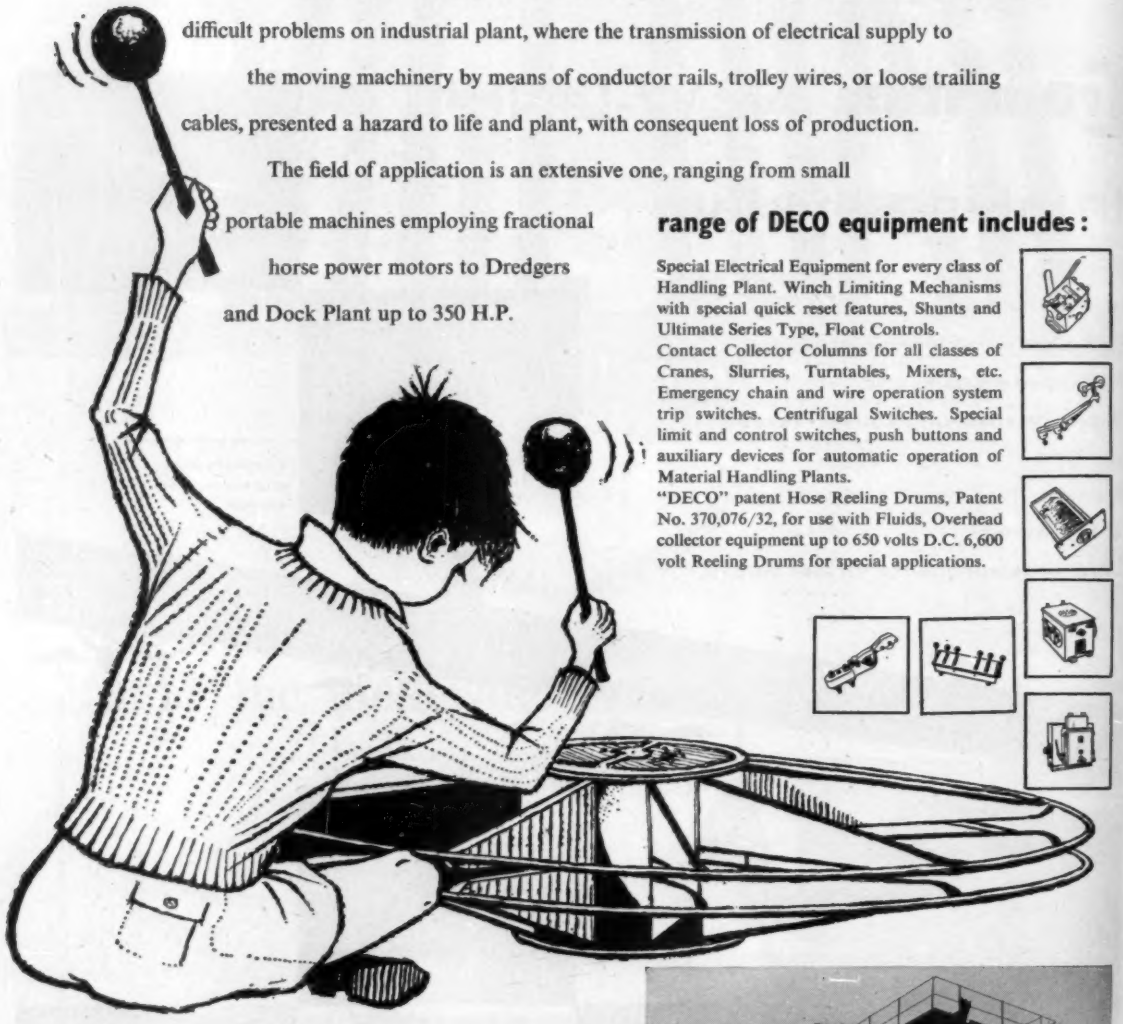
See us on Stand No. H.11 at the A.S.E.E. Exhibition

CROMPTON PARKINSON LIMITED, CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2.

# *you can't beat this drum*

DECO Cable reeling drums were designed and developed to solve one of the most difficult problems on industrial plant, where the transmission of electrical supply to the moving machinery by means of conductor rails, trolley wires, or loose trailing cables, presented a hazard to life and plant, with consequent loss of production.

The field of application is an extensive one, ranging from small portable machines employing fractional horse power motors to Dredgers and Dock Plant up to 350 H.P.



## range of DECO equipment includes:

Special Electrical Equipment for every class of Handling Plant. Winch Limiting Mechanisms with special quick reset features, Shunts and Ultimate Series Type, Float Controls.

Contact Collector Columns for all classes of Cranes, Slurries, Turntables, Mixers, etc. Emergency chain and wire operation system trip switches. Centrifugal Switches. Special limit and control switches, push buttons and auxiliary devices for automatic operation of Material Handling Plants.

"DECO" patent Hose Reeling Drums, Patent No. 370,076/32, for use with Fluids, Overhead collector equipment up to 650 volts D.C. 6,600 volt Reeling Drums for special applications.









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An illustration of a counter-weight operated radial reeling drum accommodating 130 feet of 4-core 1.3" overall diameter reinforced trailing cable for a 40-ton Goliath crane. (Photograph by kind permission of Messrs. Stothert & Pitt Ltd.)

# DECO

*cable reeling drums*

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*Tel: Ladbroke 3066/7 Grams: Etyladec Wesphone London*

P.754

THE METROPOLITAN VICKERS
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AUTOMATIC VOLTAGE REGULATORS
INCORPORATING

# AUTOMAT.

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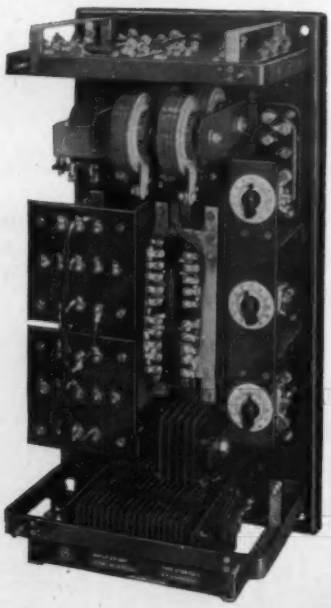

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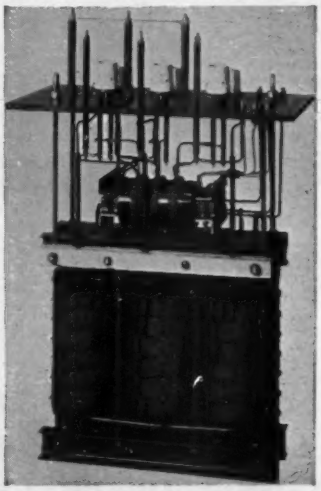

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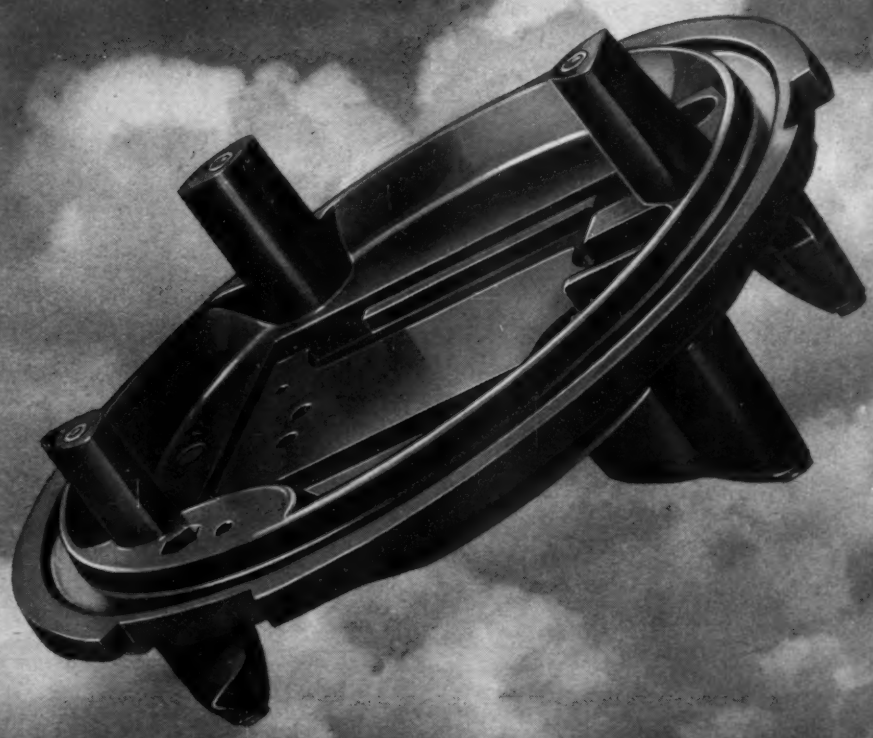

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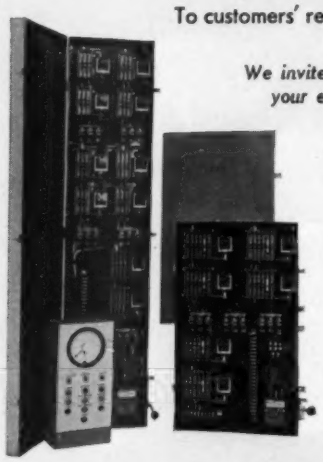

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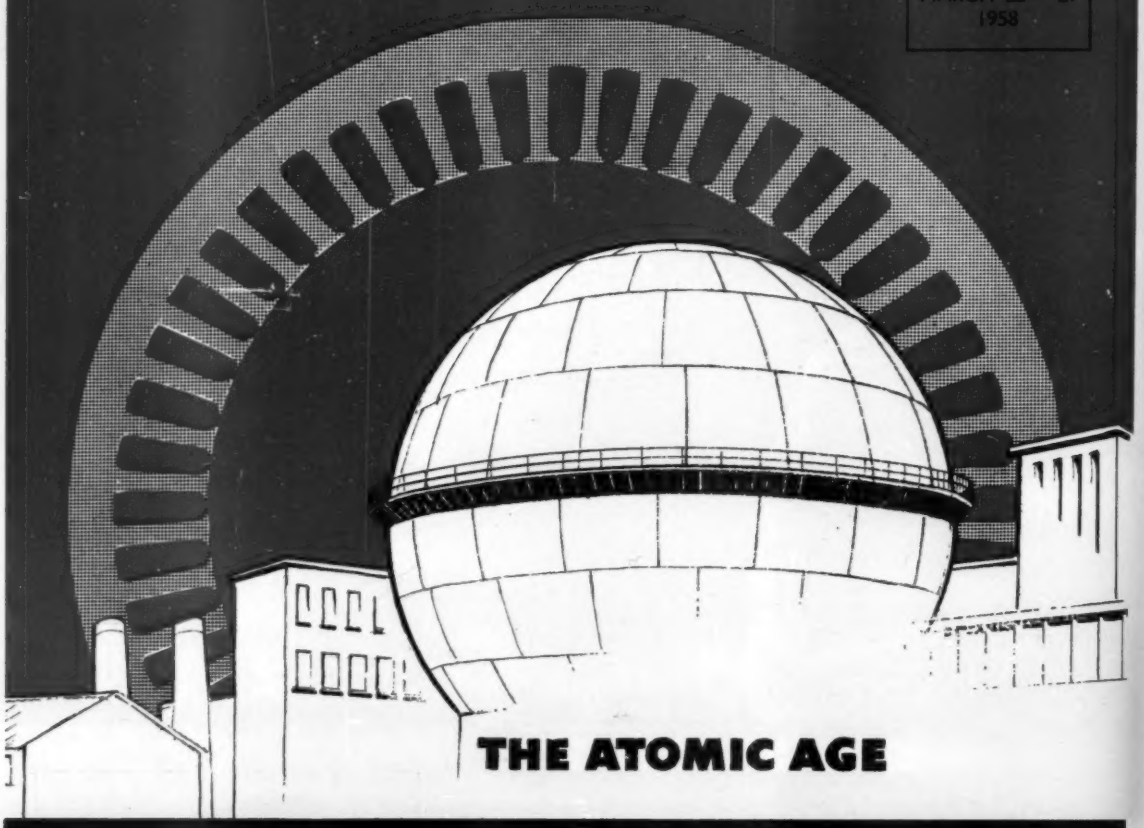

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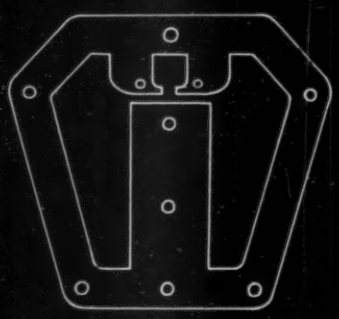

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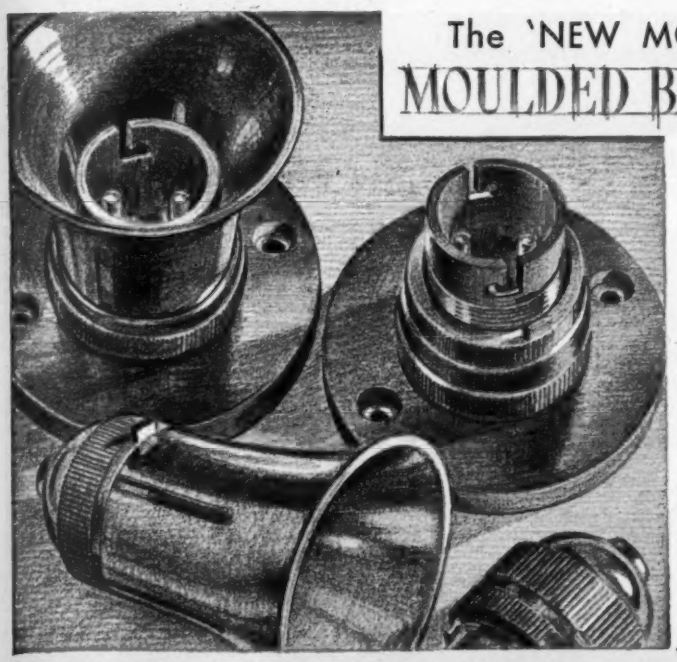

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## 8ft. 125w. GUARANTEED TUBES

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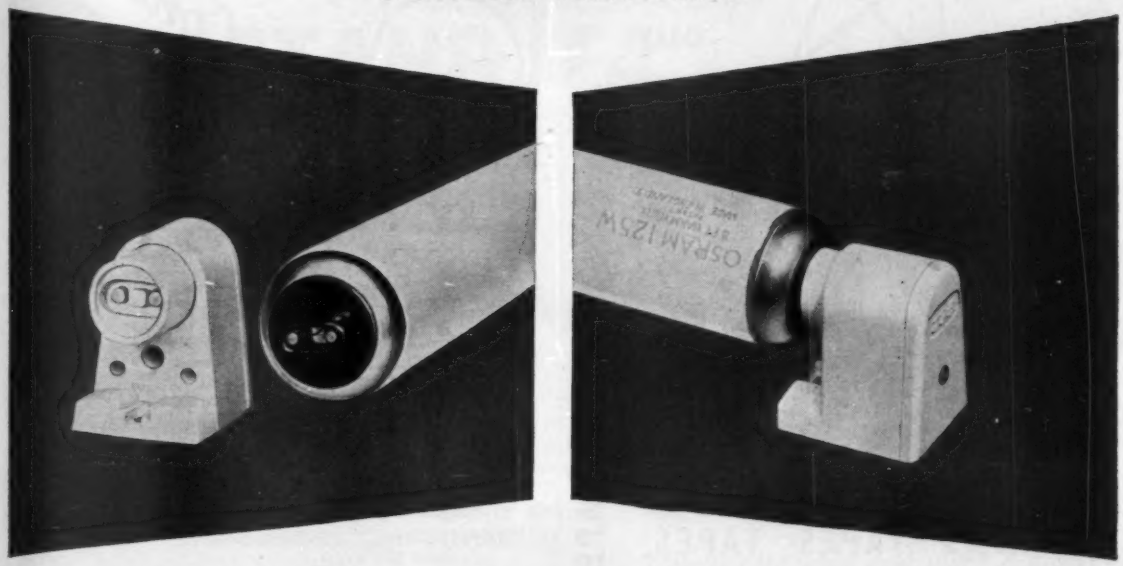


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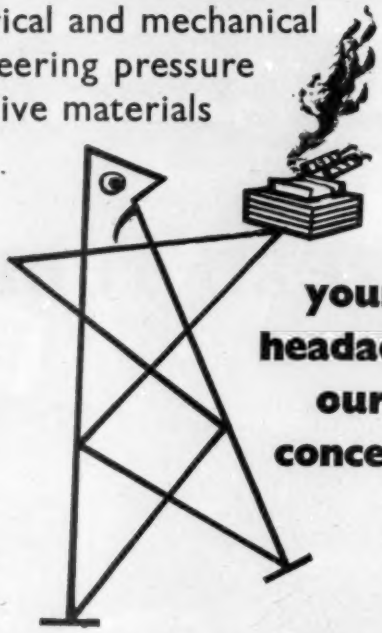

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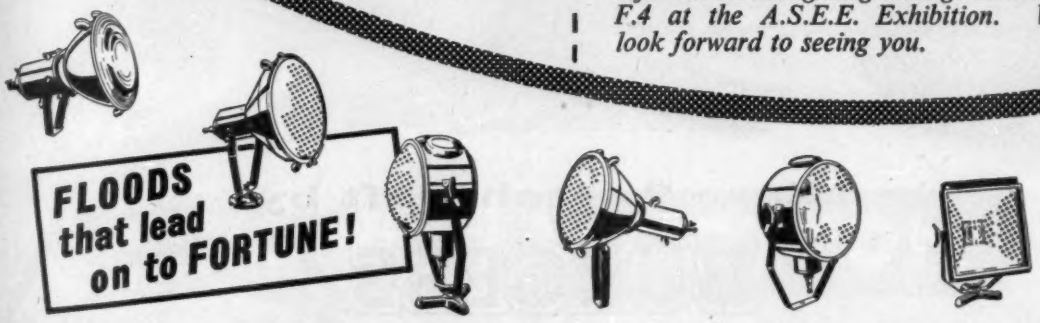


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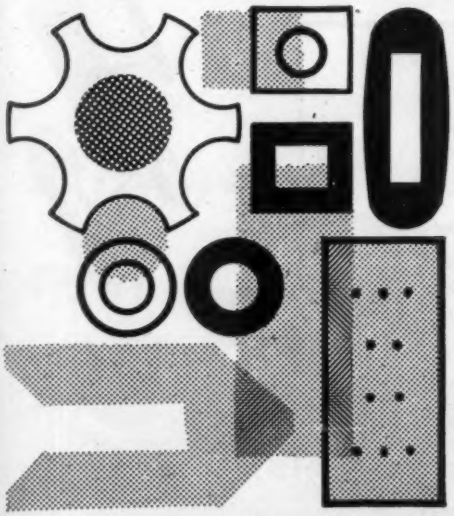

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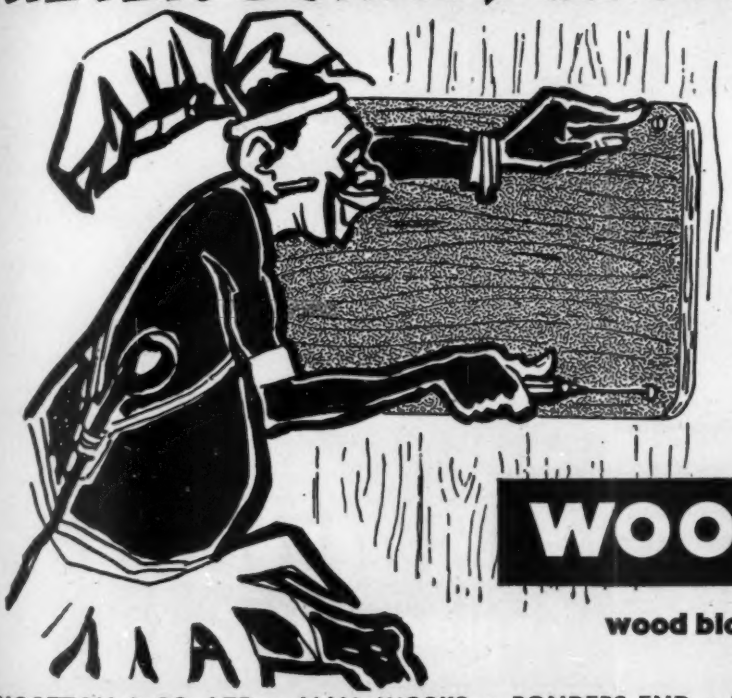

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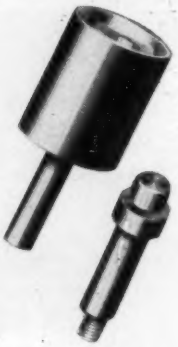

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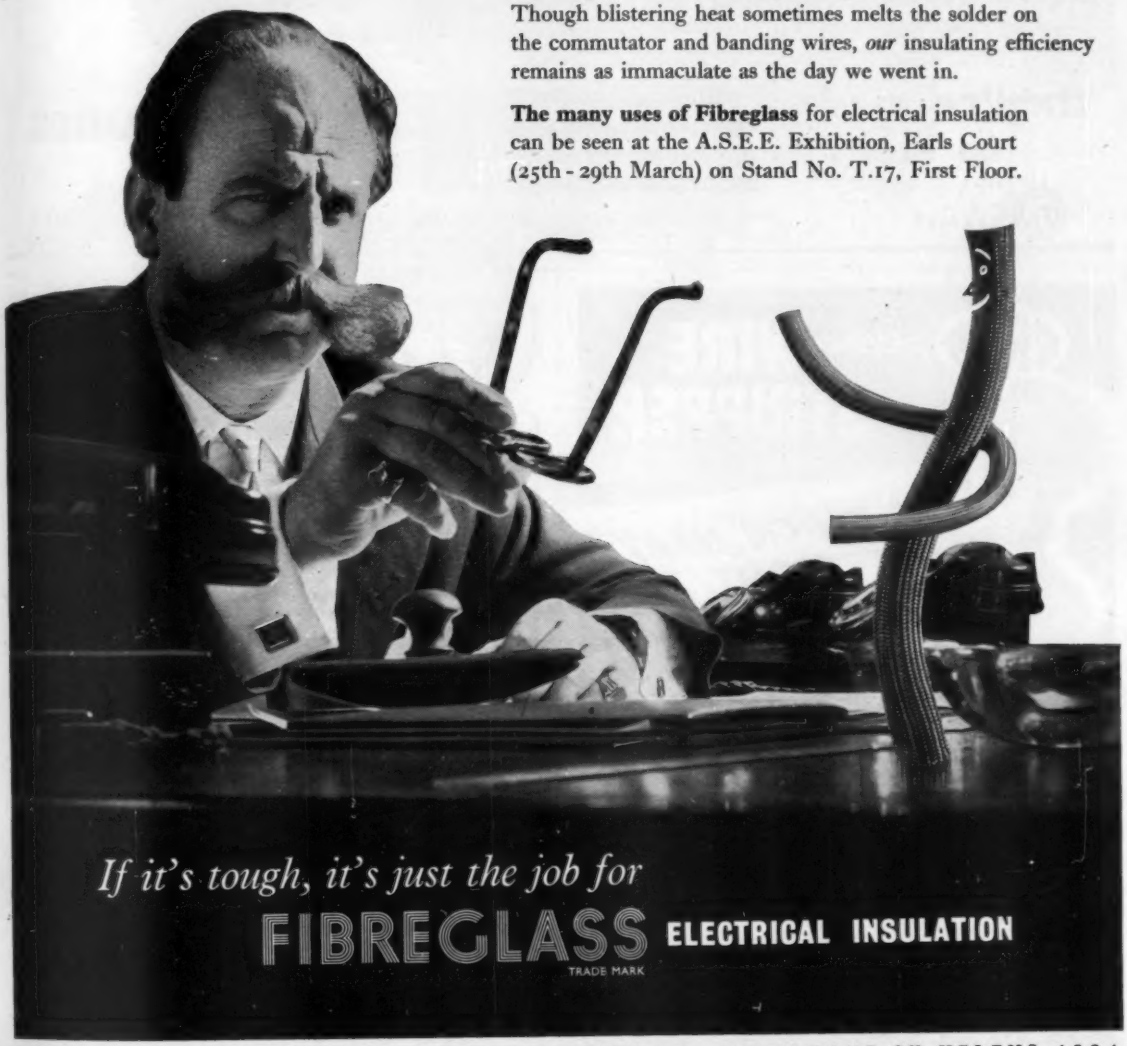
# "Fancy yourself as a crane-driver?"

*— the Big Man asked.*



We certainly did.

"*The job,*" *he added cautiously,* "*is insulating the electric motor that drives the crane.*"

"Pleasant working conditions?" we asked hopefully.

"*Not much room, or we might have considered a thicker-set chap than you*", *said the Big Man* — "*but it'll be nice and warm,*" *he added heartily,* "*by a furnace at 1500° Centigrade.*"

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"*He didn't leave,*" *said the Big Man shortly* — "*he disintegrated.*"

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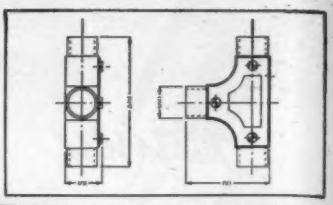

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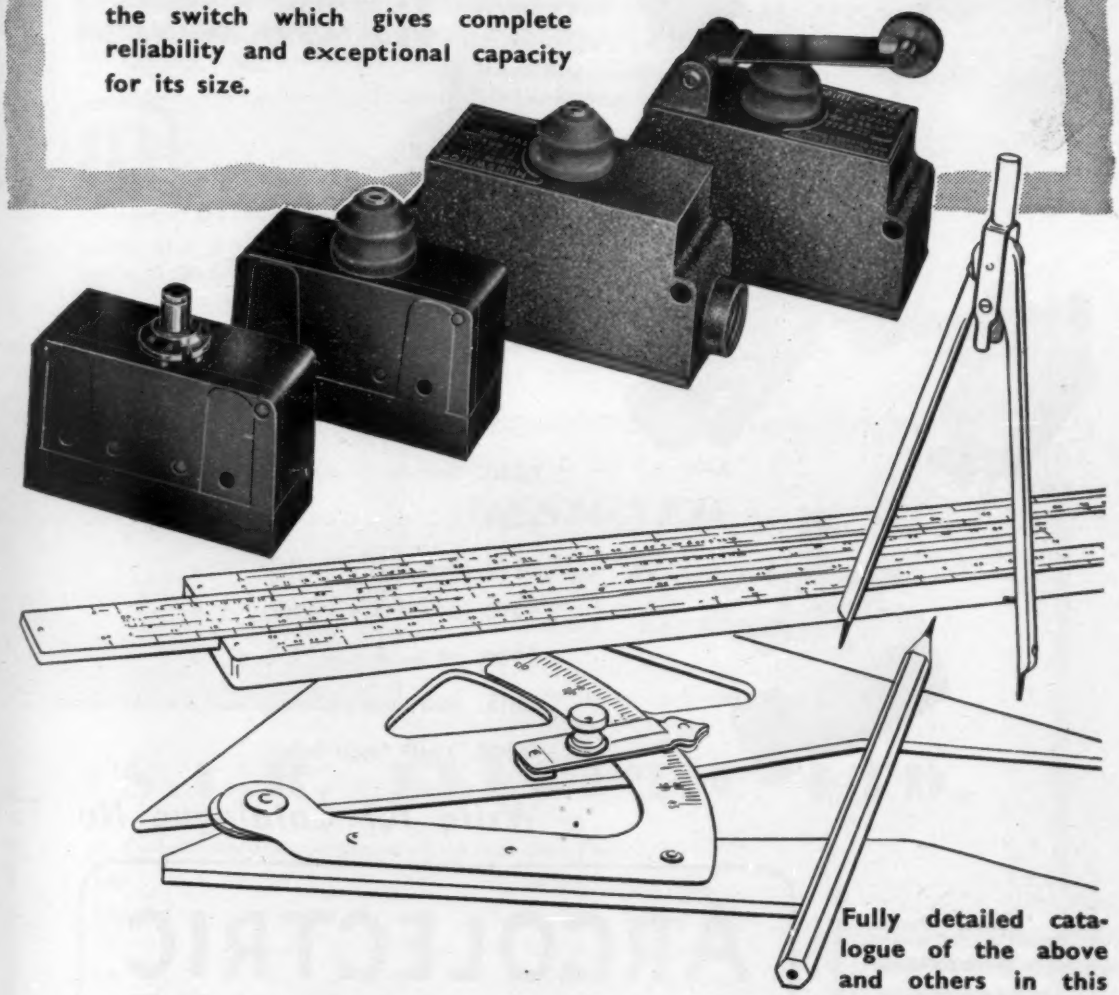

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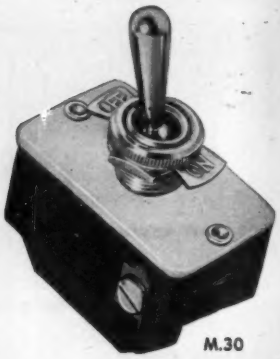


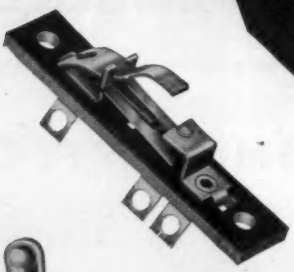


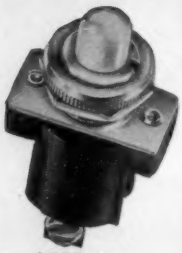


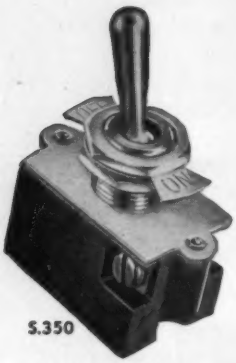


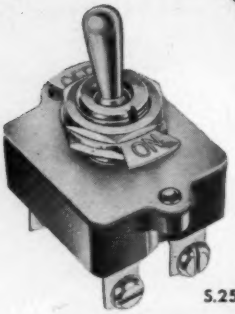


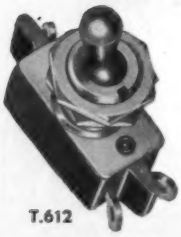


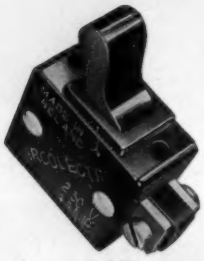


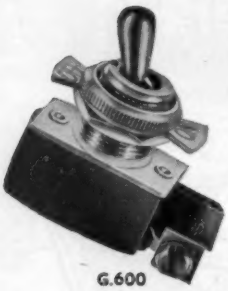


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***"When there is a better switch ARCOLECTRIC will make it"***

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**March 25th — 29th**

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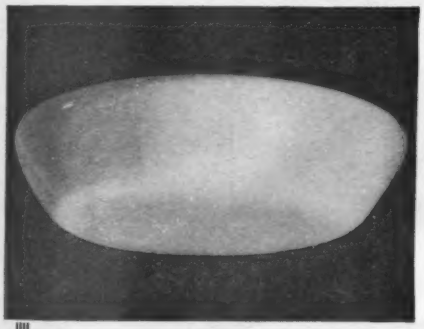

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**£4/8/0**
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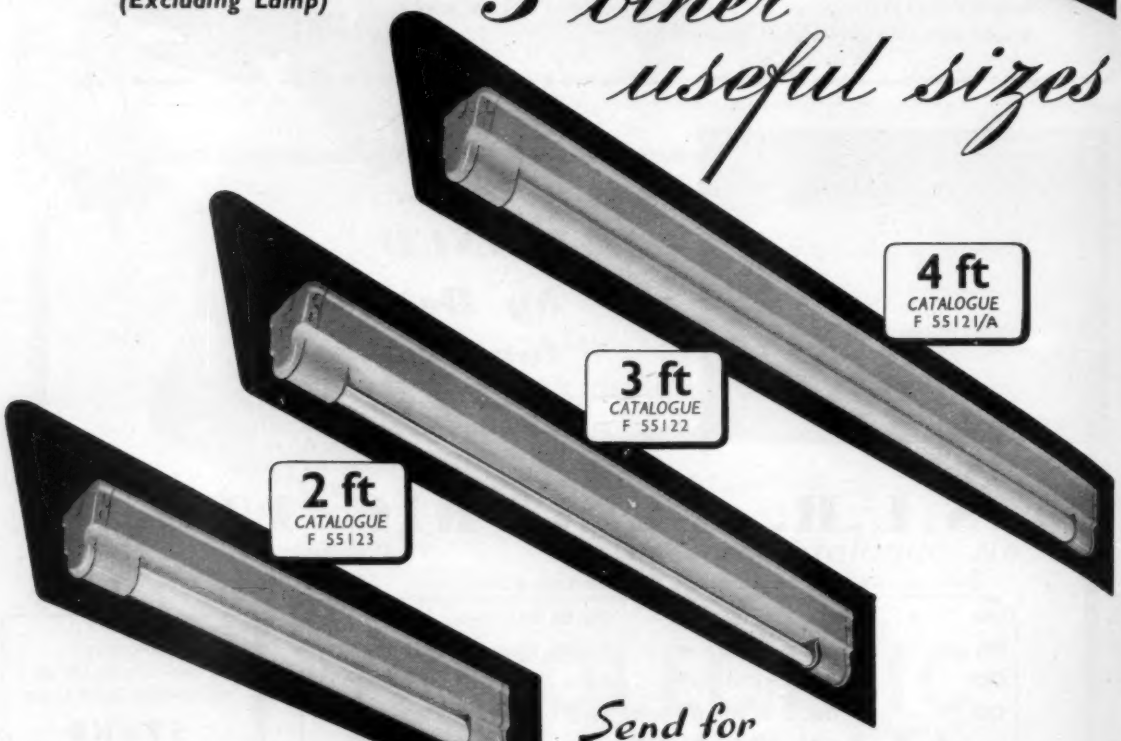


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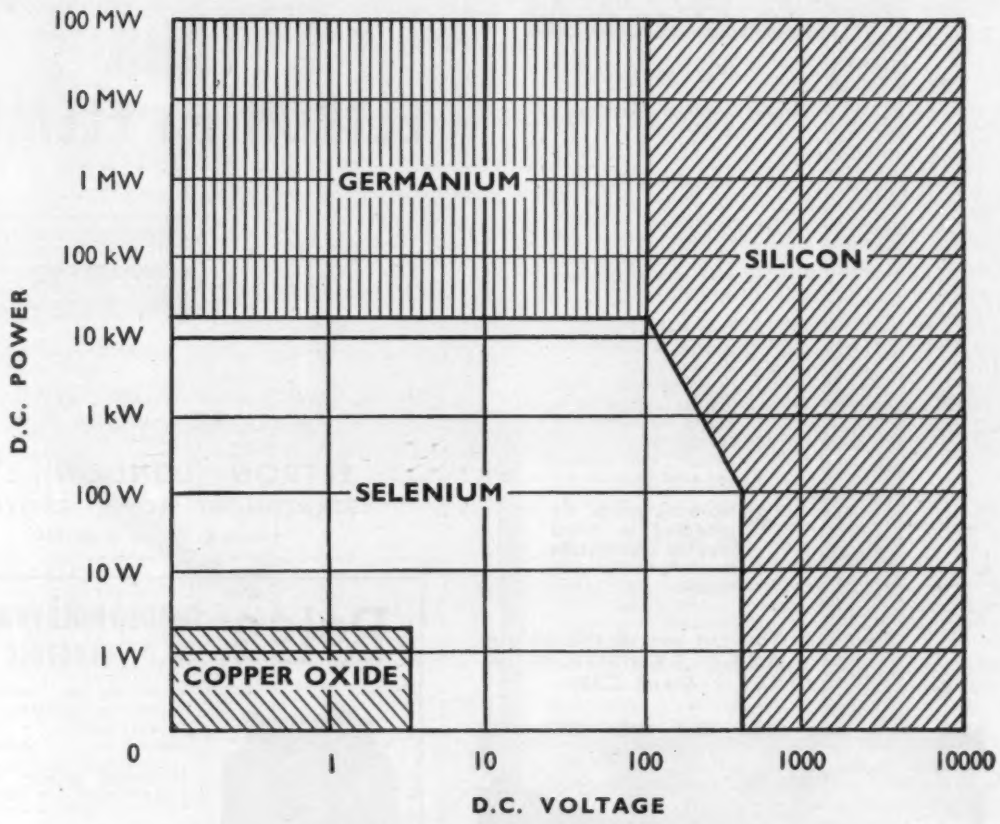


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*MARCH 25th—29th, 1958*

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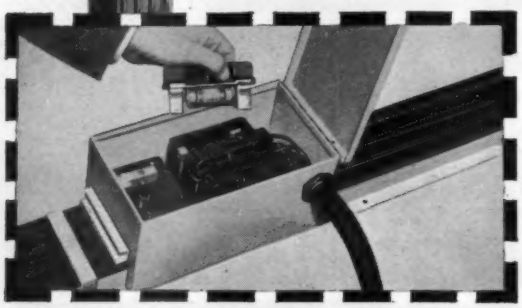

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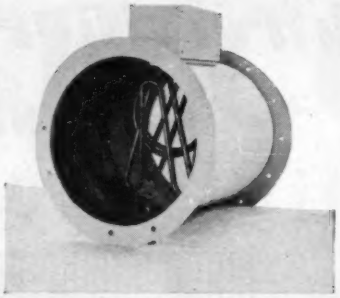

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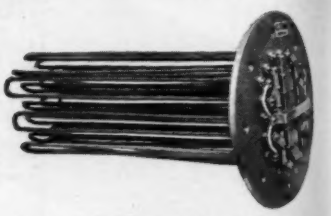

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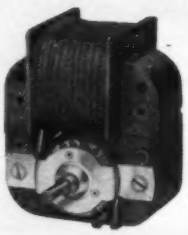

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Standard Types from 25va. to 80va. or to Customers' Specification.

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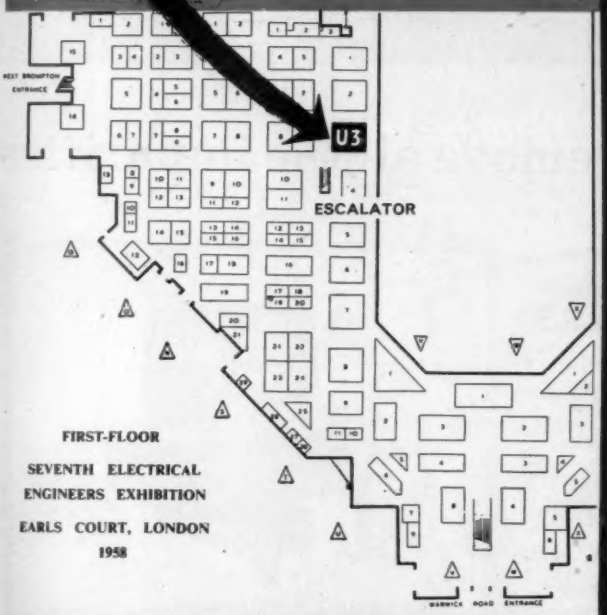


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EARLS COURT, LONDON
1958

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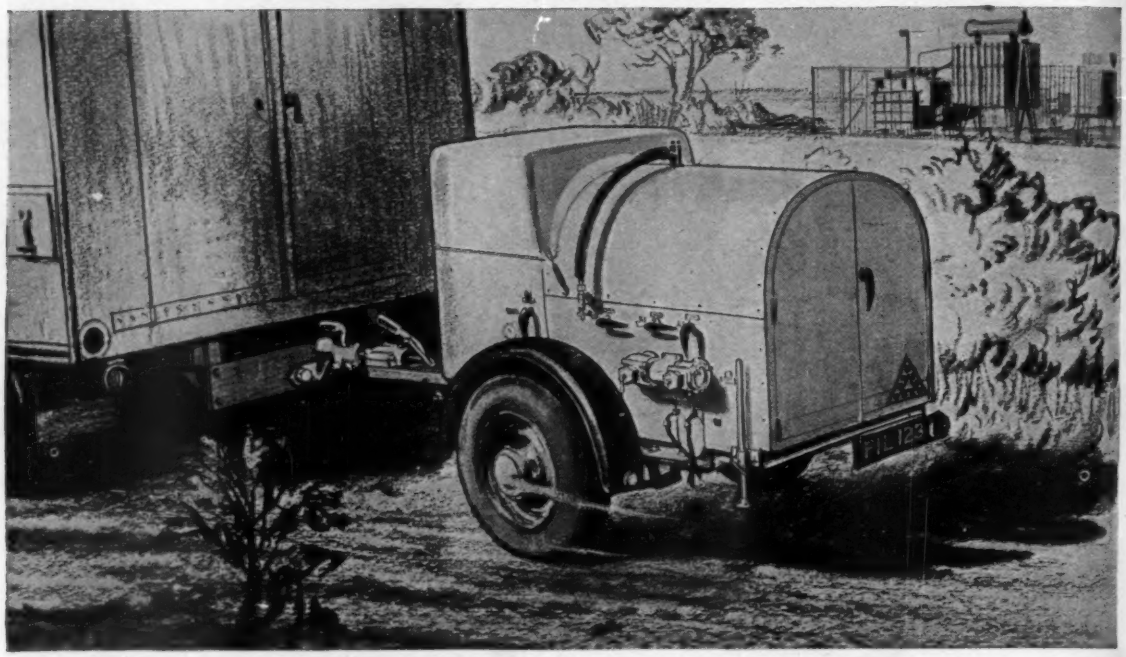

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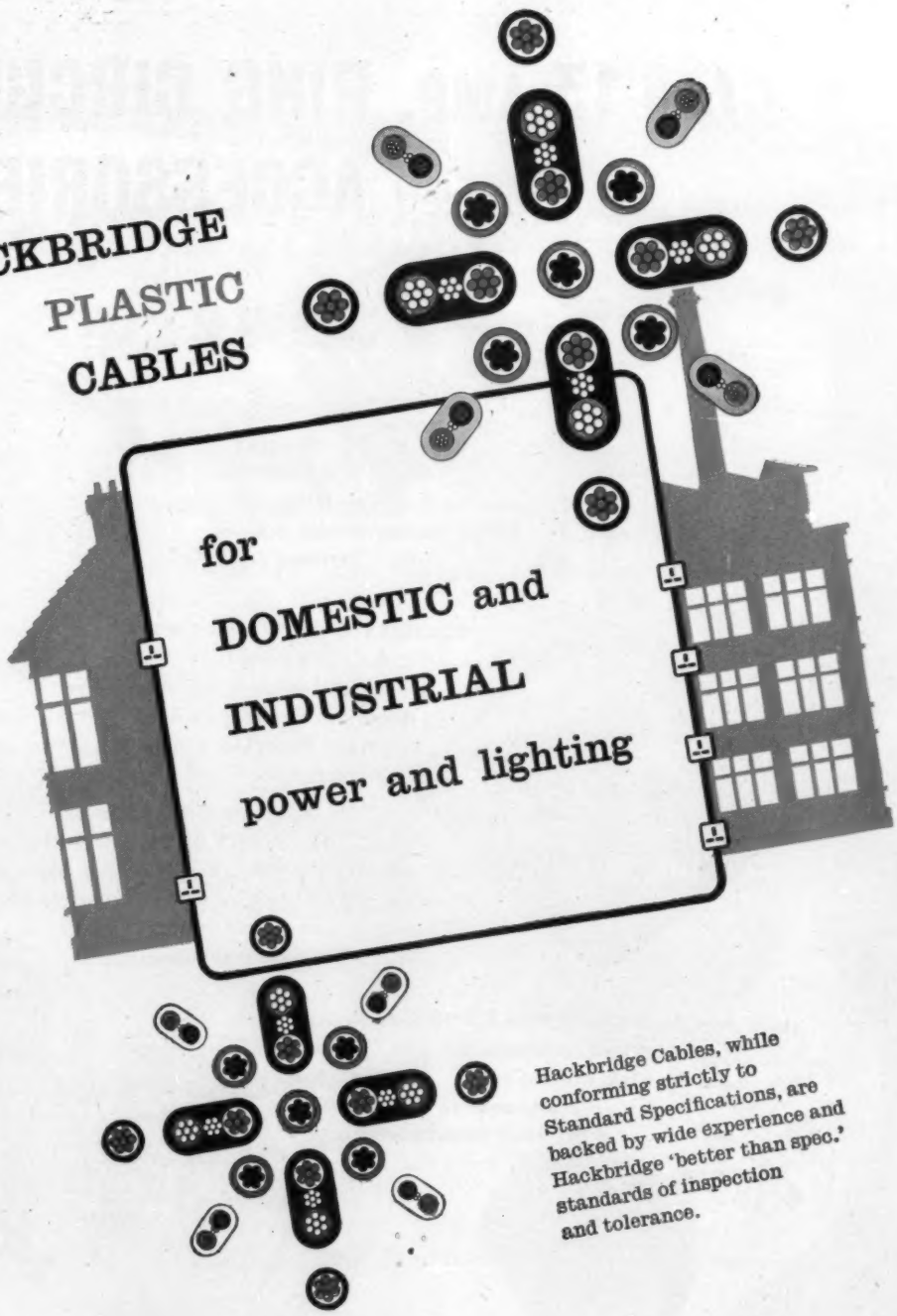


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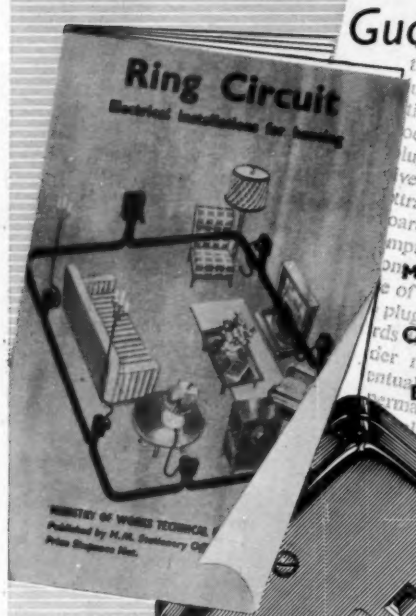

**MPG 23 SOCKET ADAPTOR**
Complies I.E.E. 611(a). Brown or Cream.
Safety shuttered twin outlets.
B.S. 1362 13 Amp. Cartridge Fuse-Link.

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B.S. 1363 & 2814
Brown or Cream. Flush, for plaster depth or deep socketboxes. Surface, with optional backplate I.E.E. 207G. Safety shuttered. Quiet switch, silver contacts, nylon pad.
SS 35

SK 31

**SELECTIVE ENTRY SPUR BOX** (Pat.) B.S. 816
3¼" dia. x 1½" x 2" fixing centres. Four cable entries, those unused closed by shutters integral with cover. Three block terminals each taking up to four 7/.029 conductors.

**FUSED PLUG** B.S. 1363. Brown or Cream. Block terminals. B.S. 1362 Cartridge Fuse-Link, 13 Amp. supplied, 10, 5 or 2 Amp. also available. Optional, High Impact resistant type, Black.
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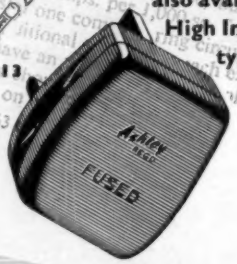

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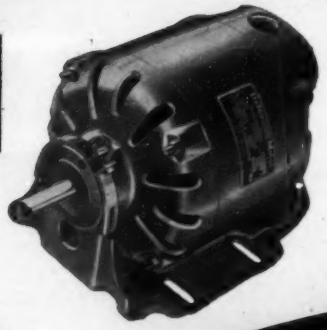
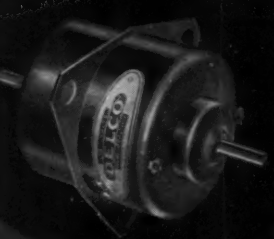
# DELCO

## electric motor

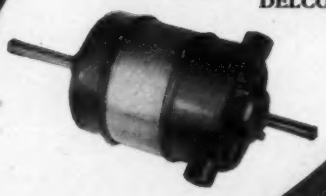
DELCO 625 Type



DELCO 258 Type



DELCO 310 Type



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When designing a new motorised product, or modifying an existing one, it's wise to call in the Delco Motor engineers. You will find their experience and skill invaluable at every stage of planning & production.

*Delco motors are used in —*
Washing Machines; Food Mixers; Projectors; Refrigerators; Air Conditioners; Office Machinery; Lawn Mowers; Furnace Blowers; Water Pumps; Farm Machinery; Kitchen Waste Disposal Units; Vegetable Peelers and many other domestic and industrial applications.

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AC-DELCO DIVISION OF GENERAL MOTORS LTD
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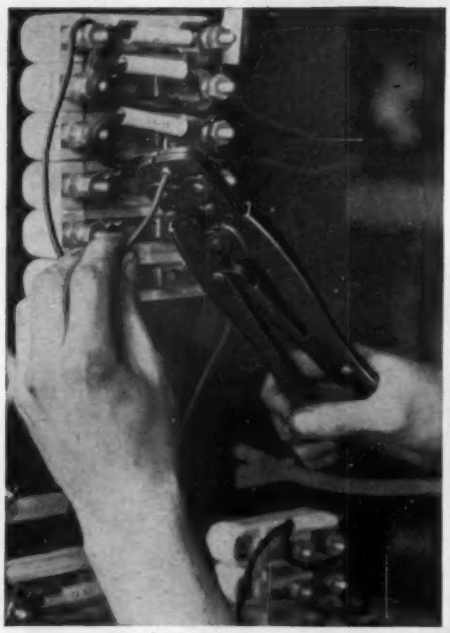
WESTINGHOUSE

use AMP*

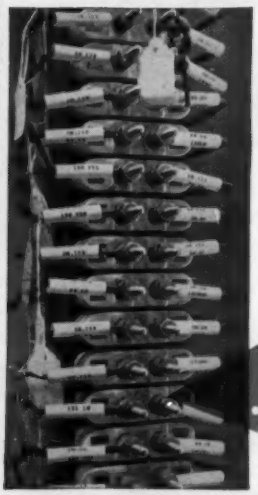
solderless wiring devices

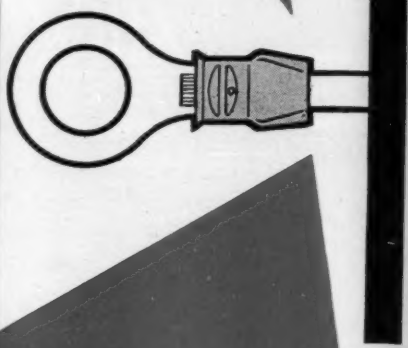
the means . . .



Close-up of Heavy Duty Plasti-bond Terminals being applied during erection of the new Signal Installation at St. Pancras.

Close-up of fitted Terminal Block.





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AP-71

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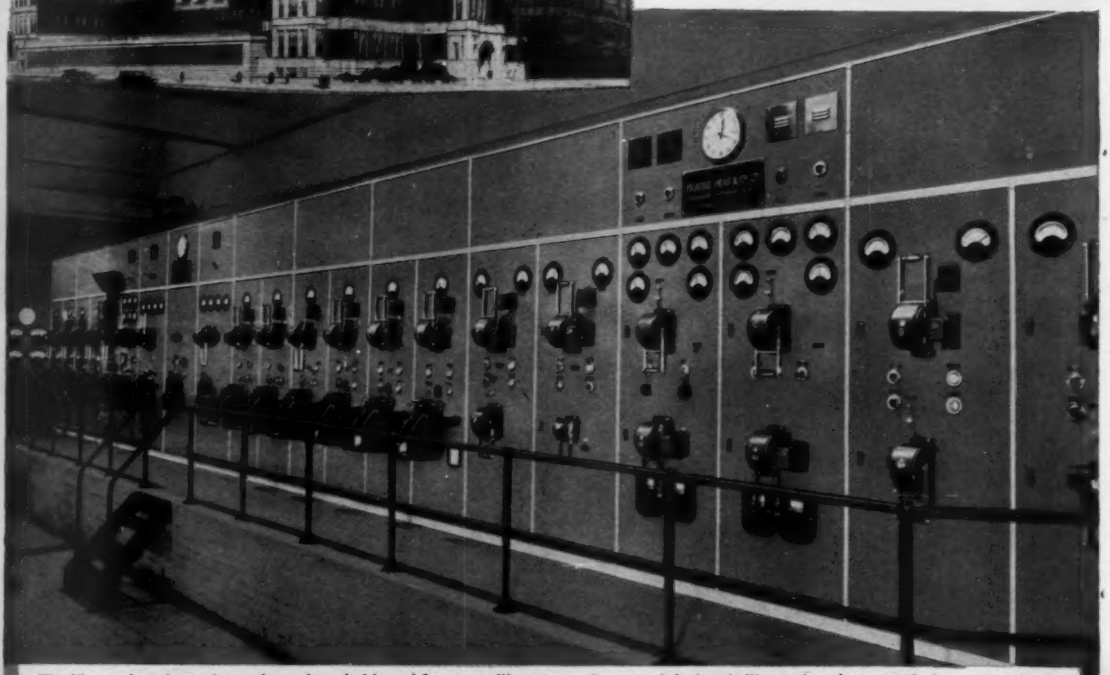
## have installed

# "ERSKINE HEAP" SWITCHGEAR & MOTOR CONTROL GEAR

The Architects for the building were Bradshaw, Gass and Hope of Bolton, who were also responsible for the design of the engineering services.



The illustration above shows the main switchboard for controlling the power and lighting to both the original College and the New Extensions. The switches are of 25 MVA rupturing capacity, tested to BS.116 at 400 volts. Duplicate bus bars are provided with front-of-board operated changeover switches for changing over between the College's own Turbo Alternator Set and the Electricity Board.

Bottom left hand illustration is one of the many circuit breakers for controlling the lift installations.
The centre illustration below shows a few of the twelve distribution boards throughout the building.
The bottom right hand illustration shows one of the solenoid operated 25 MVA ironclad circuit breaker units.

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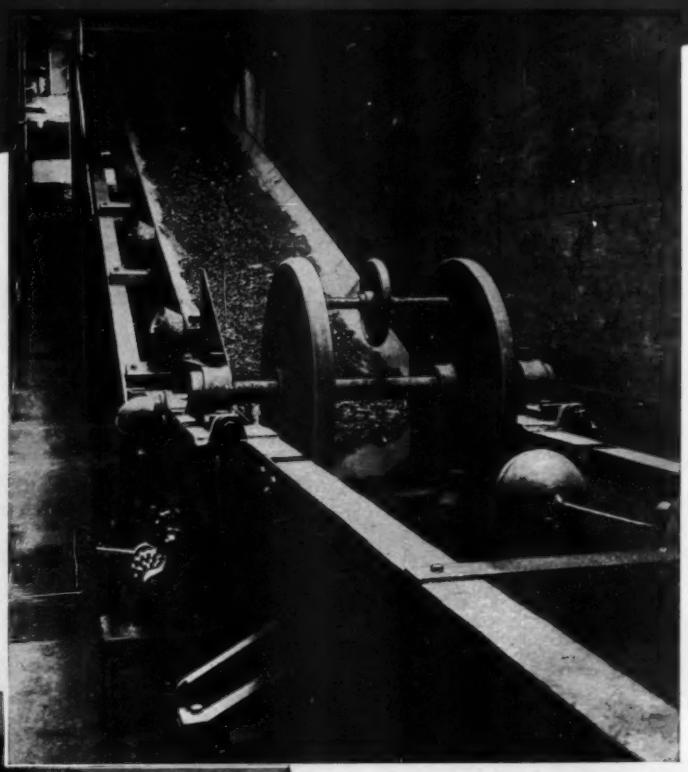
# JOHN THOMPSON SUBMERGED ASH CONVEYORS



*The discharge end of the submerged conveyor belt emerging from the trough.*

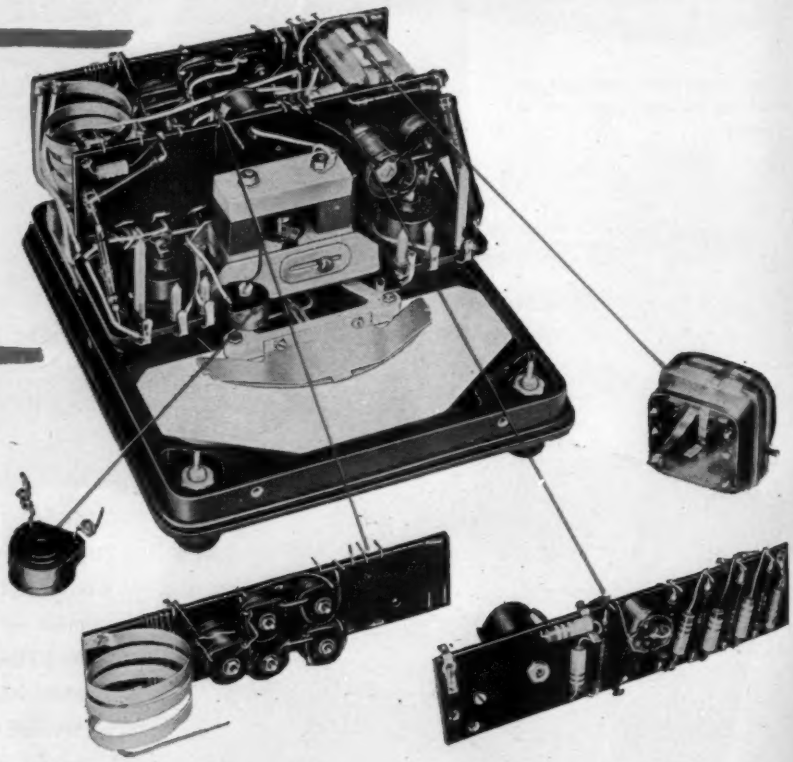
*The trough with submerged belt, showing the ash chutes from the boilers.*

The John Thompson Submerged Ash Conveyor is simple and effective, requiring almost no upkeep. A water trough runs along the range of boilers; from the boiler ash hoppers the hot ash falls through chutes into the water and is quenched before reaching a submerged conveyor belt which carries it away. At the end of the conveyor the submerged belt rises from the water trough and discharges the ash. There is no possibility of dust escaping. Power consumption is very low.

JOHN THOMPSON CONVEYOR COMPANY · JOHN THOMPSON GROUP · WOLVERHAMPTON

The famous Avometers are possibly the most widely used instruments of their type in the World and have an excellent record of service under all climatic conditions, even at arctic temperatures. In tropical climates, however, there is a constant risk of derangement due to humidity, heat, and the development of fungoid growths. To meet these conditions, the manufacturers of Avometers have produced special types known as Models 7X, 8X and 8(S)X, which are suitable for continuous use in any extremes of heat or cold. In these instruments, certain components are potted in Araldite epoxy resin, which has the advantages of remarkable adhesion to metals, ceramics, etc., good dielectric properties, low shrinkage, resistance to moisture and extremes of climate, and complete freedom from micro-biological attack.


***Poles apart***



*Araldite epoxy resins have a remarkable range of characteristics and uses.*

They are used

- ★ **for bonding metals, porcelain, glass, etc.**
- ★ **for casting high grade solid insulation**
- ★ **for impregnating, potting or sealing electrical windings and components**
- ★ **for producing glass fibre laminates**
- ★ **for producing patterns, models, jigs, tools, etc.**
- ★ **as fillers for sheet metal work**
- ★ **as protective coatings for metal, wood and ceramic surfaces**

**See our Exhibit**
**Stand No. T6, A.S.E.E. Exhibition**
**Earls Court, March 25th–29th**

Araldite *epoxy resins*

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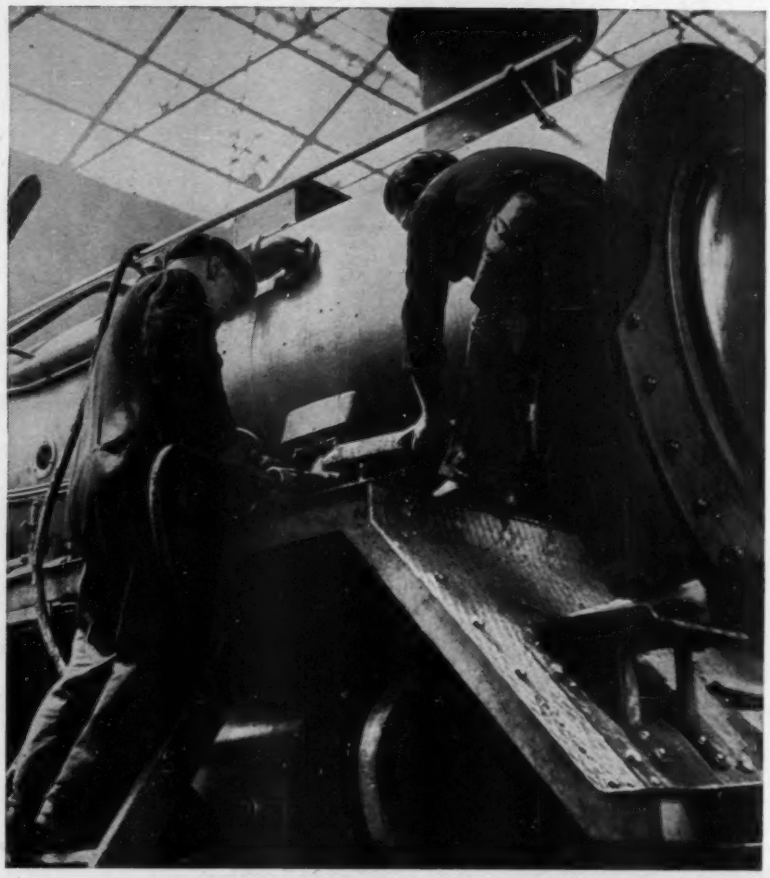
AP316

# C.M.A. Cables at work



*Building a locomotive. Here the operator is drilling platform plates at the smokebox end.*

In the locomotive engineering works of the Midlands, in factories all over the country, at home or abroad, wherever you go C.M.A. cables are at work. In the air, underground or underwater, in ships, coalmines and powerhouses, C.M.A. cables are transmitting power, unobtrusively . . . reliably . . . year in year out. For over 100 years members of the Cable Makers Association have been concerned in all major advances in cable making. Together, member firms of C.M.A. spend over one million pounds a year on research and development. At every stage from raw material to finished cable, technical knowledge is pooled and research co-ordinated to avoid wasted effort. This highly-organized co-operative research activity has contributed largely to the world-wide prestige that C.M.A. cables enjoy. It has put Britain at the head of the world's cable exporters. Technical information and advice is freely available from any C.M.A. member.

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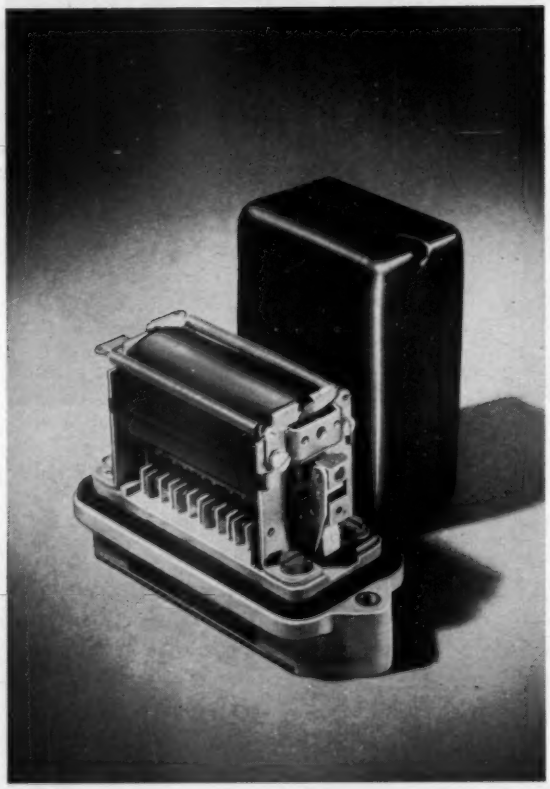

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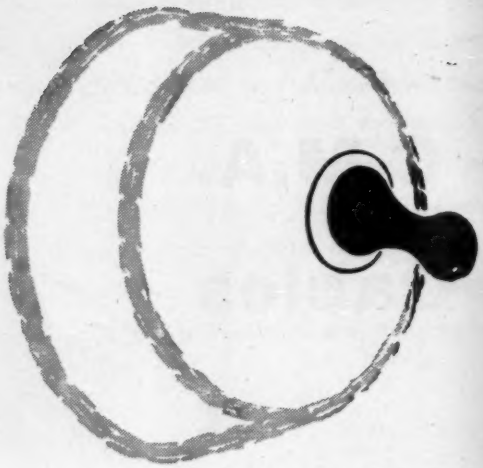

# NOBODY EVER NOTICES ME!

They're quick enough to switch me on first thing in the morning when the light's bad—but they never remember to switch me off again when the daylight improves. Just think of all the current I'm wasting, just because people forget me!
Why don't you fit a **SAVELITE?**
Why not, indeed? The 'Savelite' is a new photo-electric device which warns factory and office workers when to switch off unnecessary lights. Easily and cheaply installed in individual offices and workshops it *cuts* electric light bills to the barest minimum, and saves its cost in a very short time.

*A 'Savelite' is a neat little photo-electric unit that fits in the window and literally watches daylight and tells you when artificial lighting is not required. Take a walk round your works—it may surprise you to see how much money is being wasted on unnecessary lighting (lights which they have* **forgotten** *to switch off!) The 'Savelite' unit costs only 23 gns.—quickly saved out of your electricity bill. And remember—more light is wasted in the lighter months.*

CUT CUT THOSE ELECTRICITY BILLS BY INSTALLING

**SAVELITE**

**IT REACTS TO LIGHT AS A THERMOSTAT REACTS TO HEAT**

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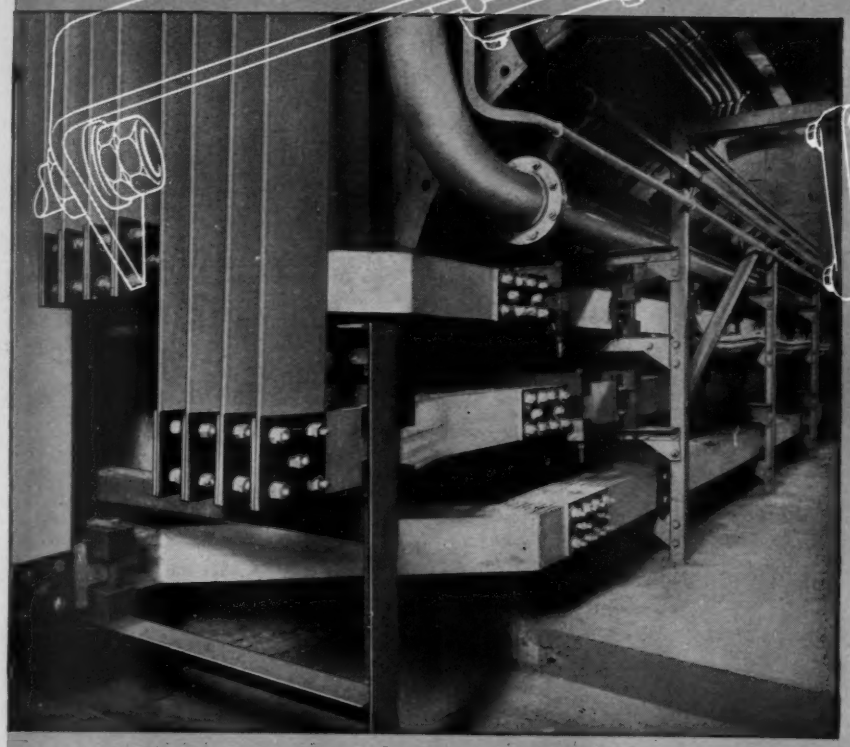

Aluminium for busbar is no longer a novelty—experience has proved its right to be considered on equal terms with copper. Sometimes, conditions will weigh the balance in favour of the more conventional material. In many instances, aluminium is more economical and equally efficient, particularly when 'Kynal' Busbar Jointing Compound is used to ensure strong, corrosion-resistant joints.

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ICI METALS DIVISION

KI-73

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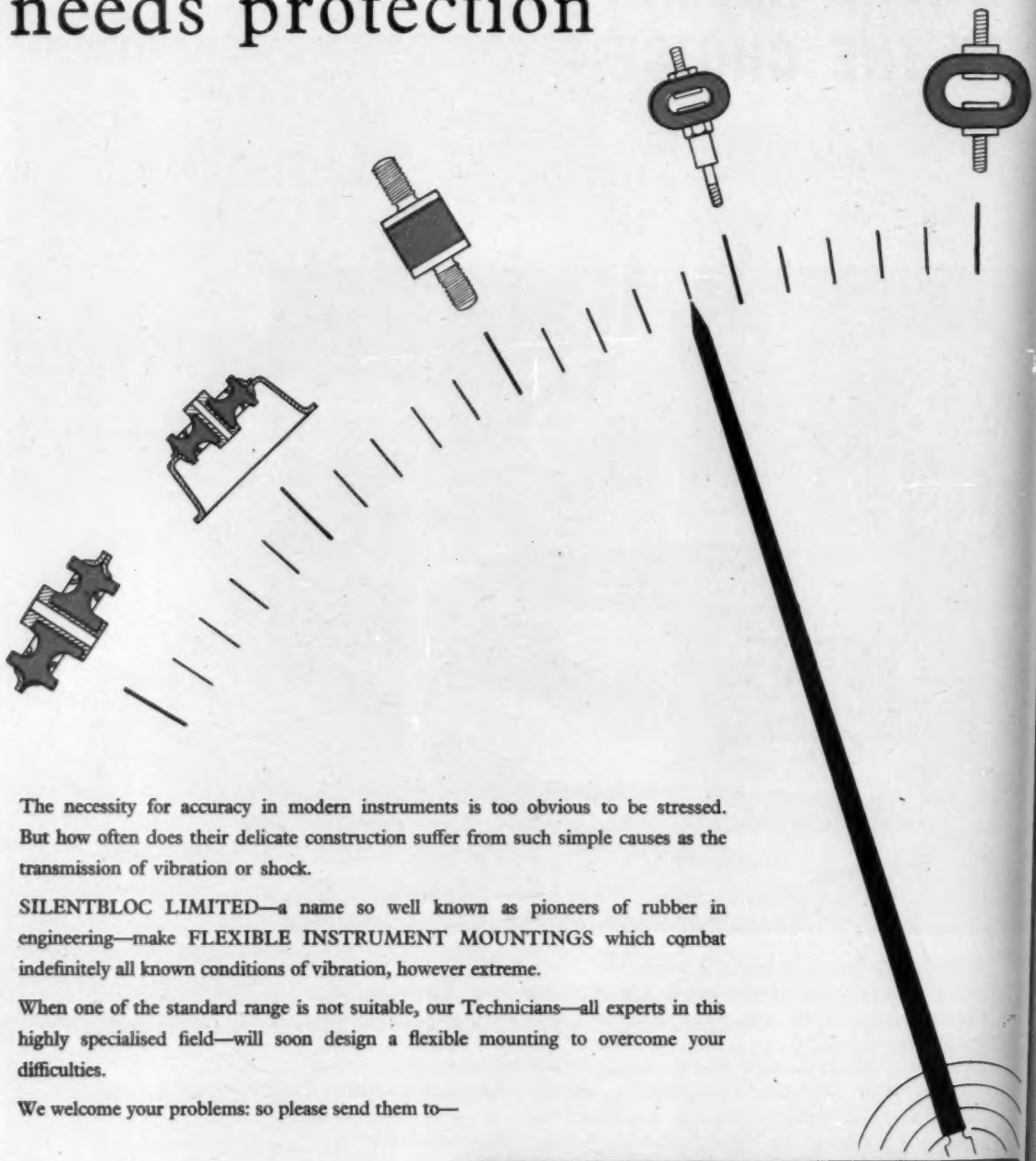

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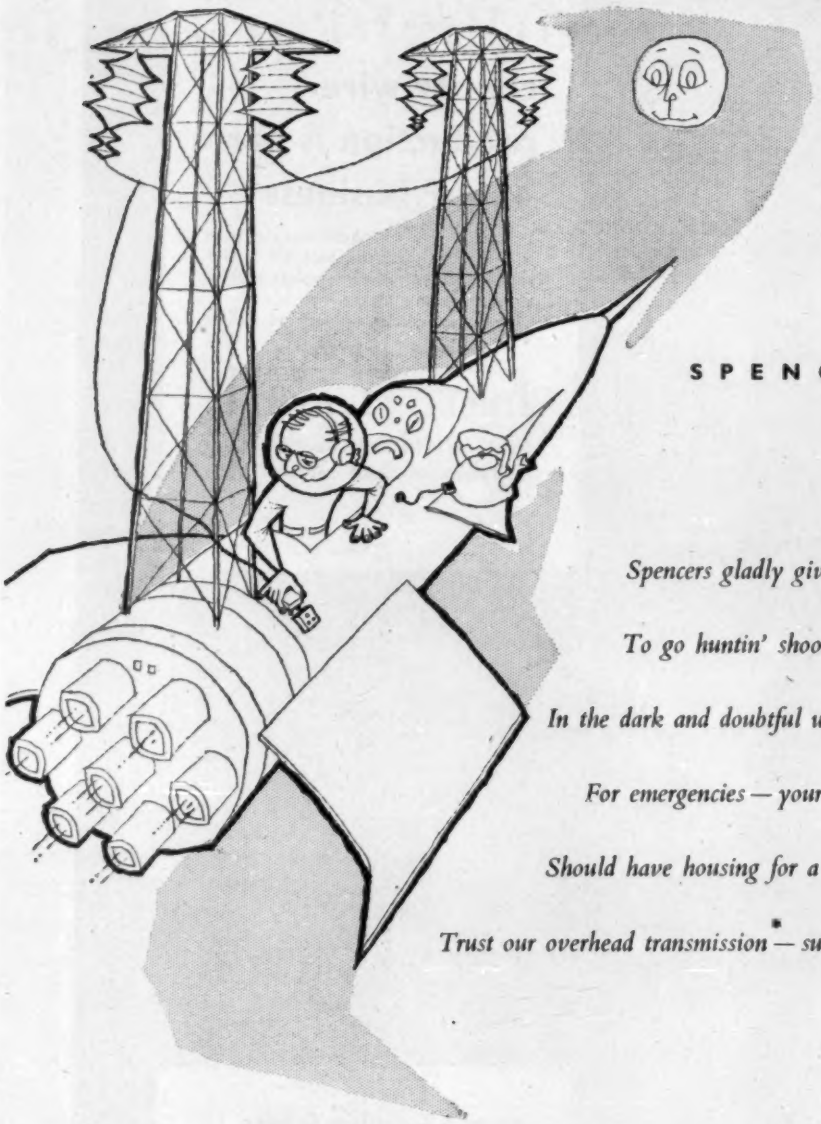

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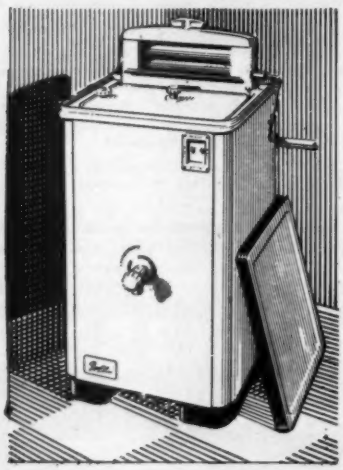

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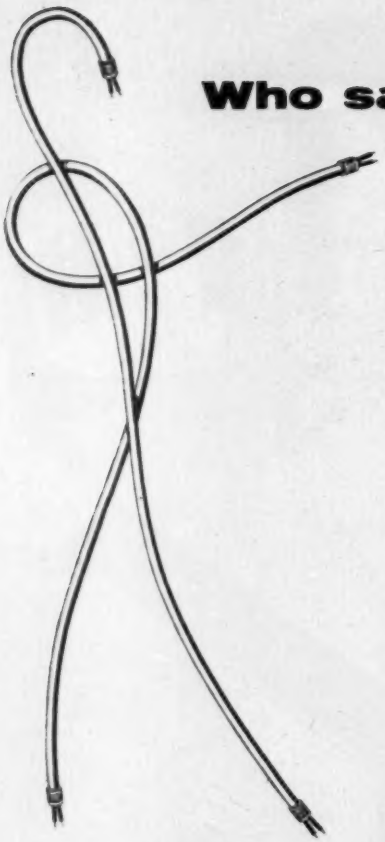

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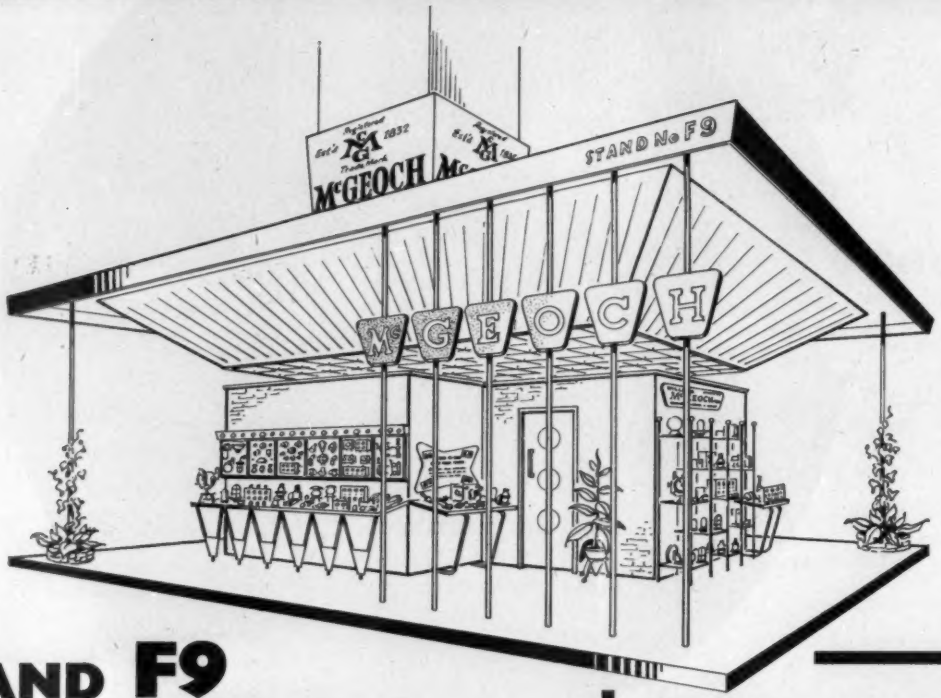


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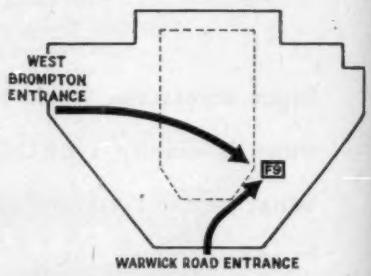


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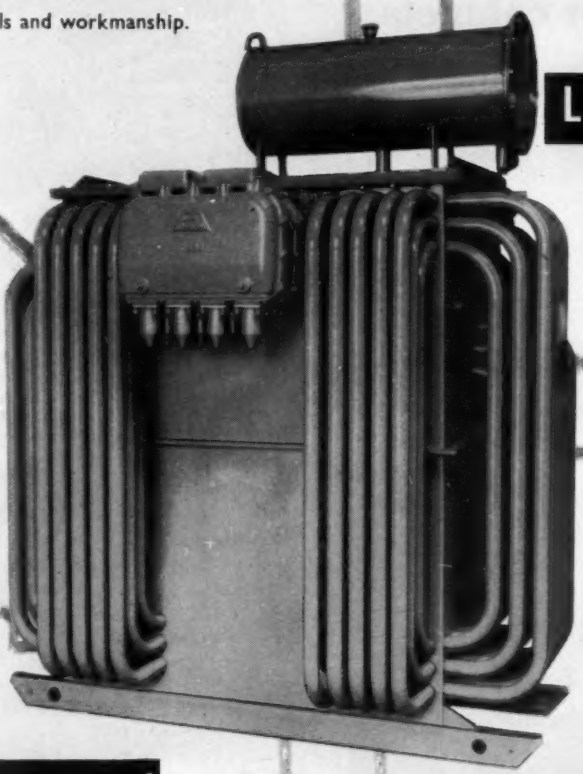

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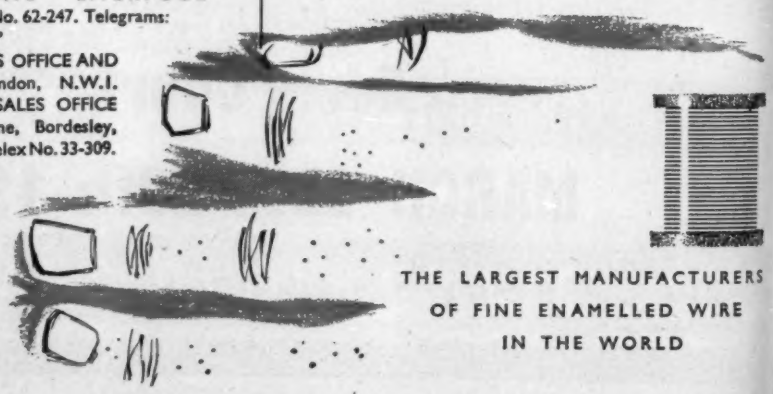

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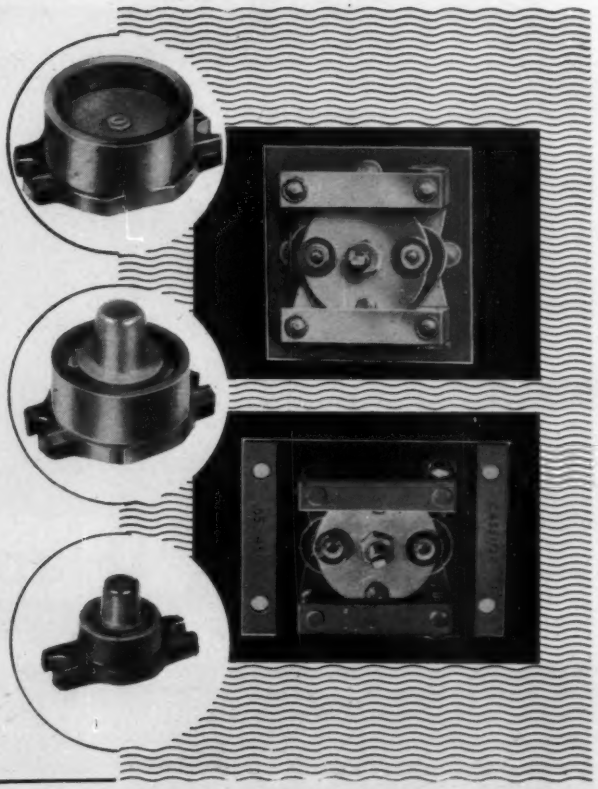

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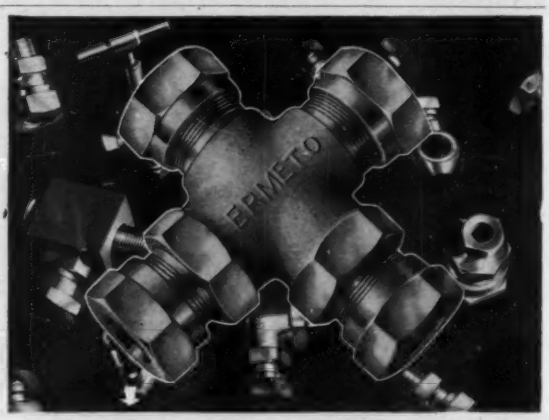


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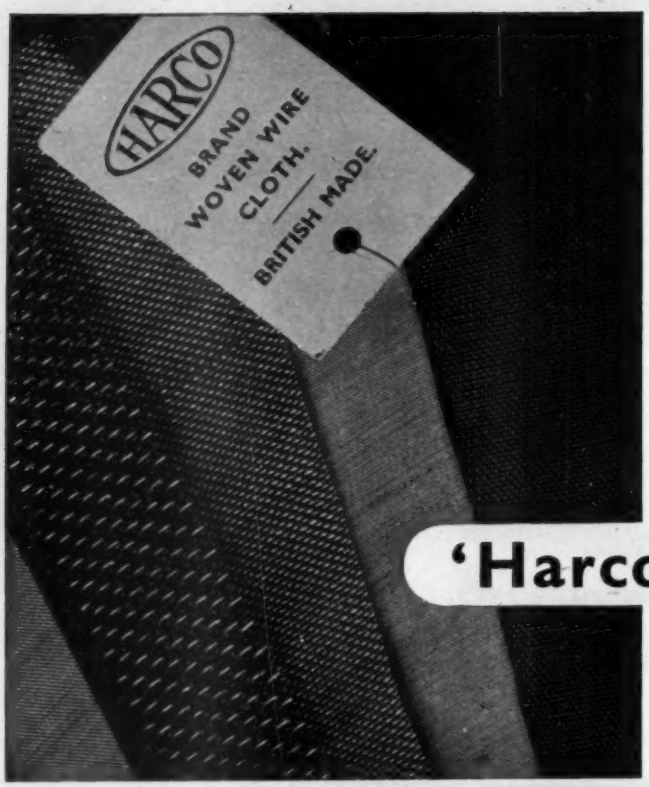


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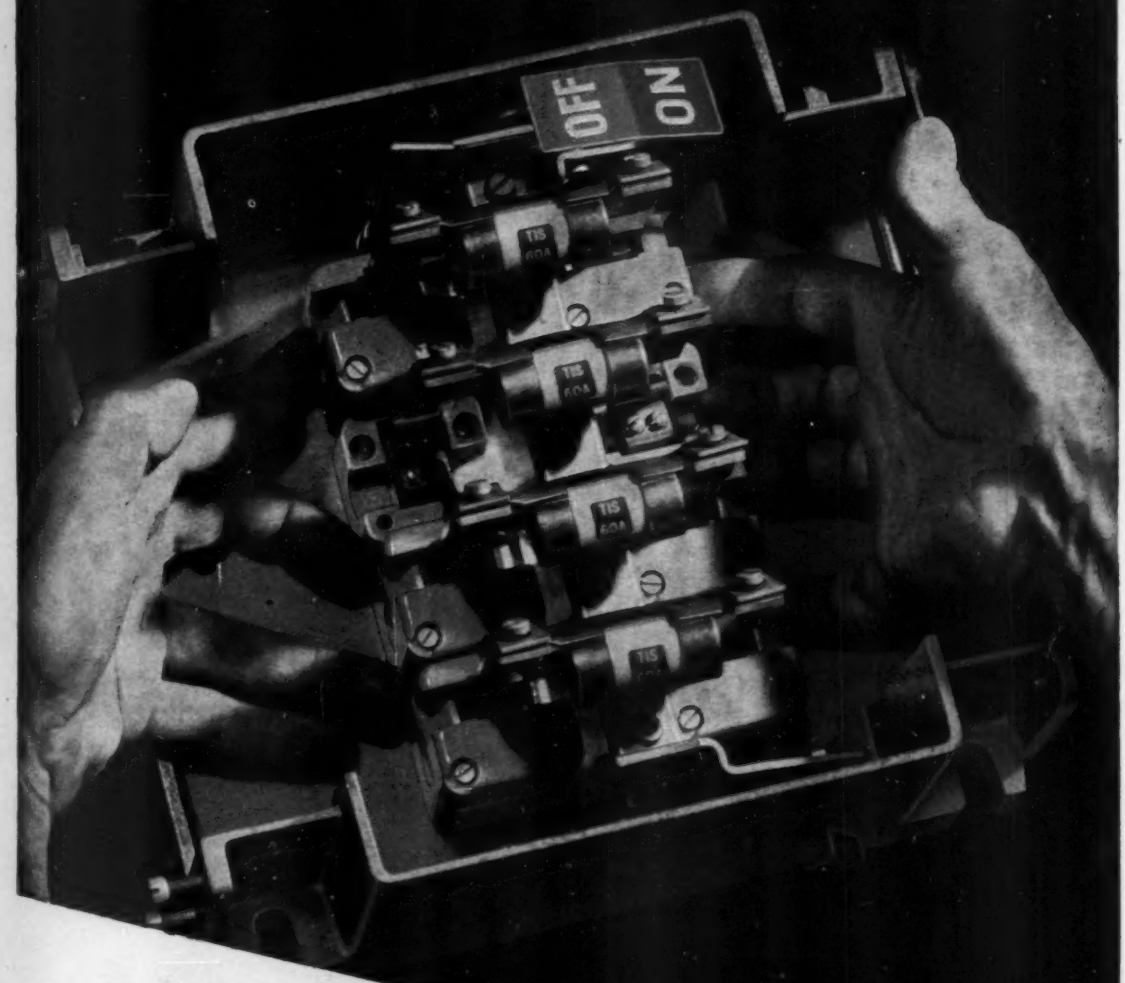


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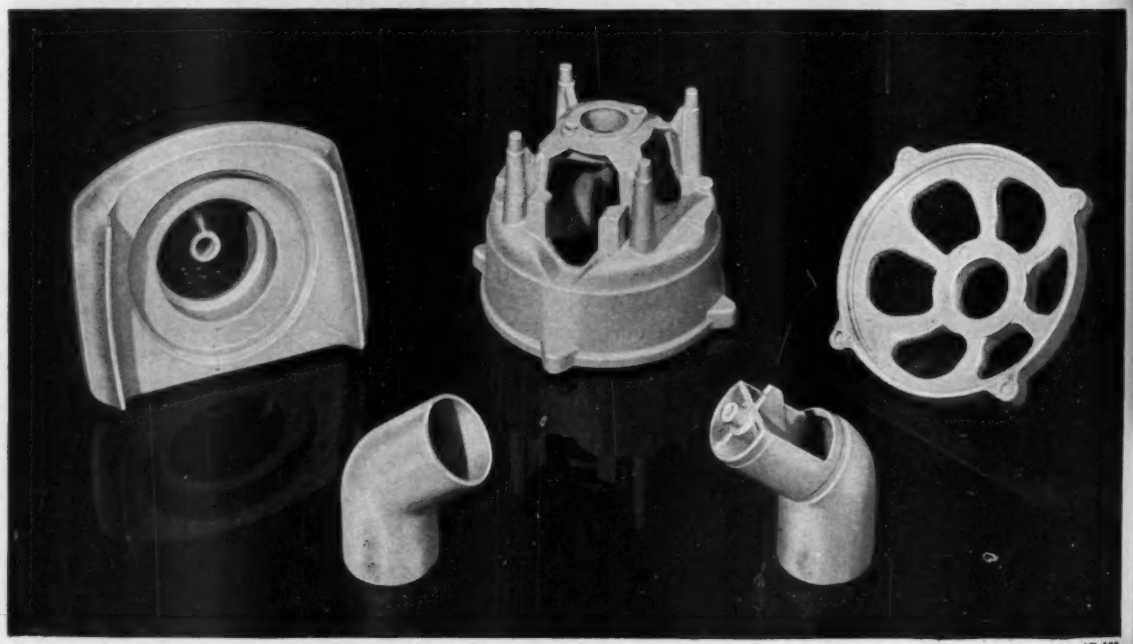

AP-123

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*Type A shown above is fitted in all 4 corners for crane lifting. Load 1½ tons, stacking 5 high: Weight 110 lbs.: 24" x 36" x 26" high. Ground clearance 4½". Type B has a ground clearance of 7½" and is 29" high.*

*Type C and D (shown right) are similar to A and B with weldmesh panels.*

*At left is type B.3.1. (with detachable side panels). Load 2 tons, stacking 5 high: Weight 200 lbs.: 40" x 48" x 40" high. Ground clearance 4".*

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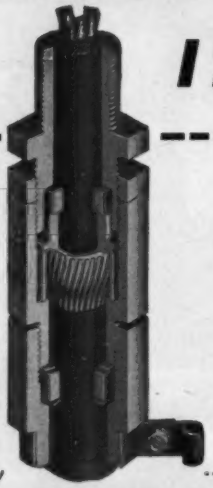

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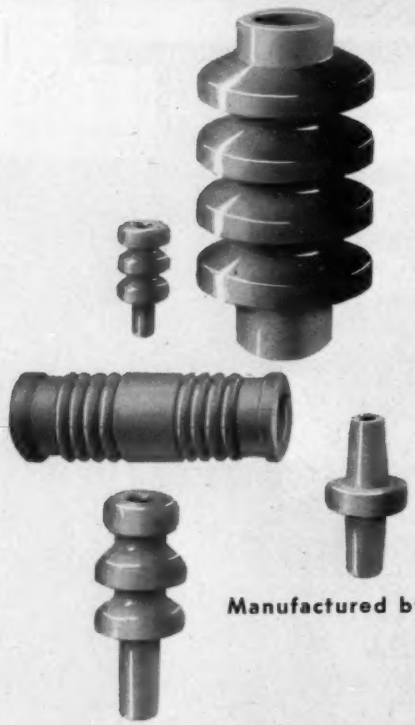

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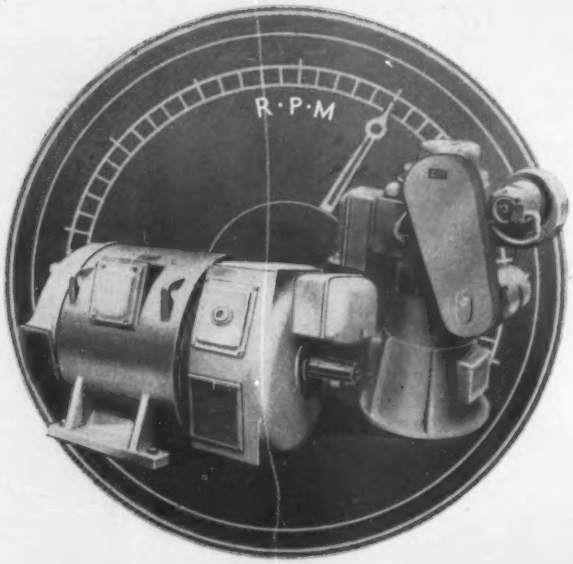


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*Photograph by courtesy of Marconi's Wireless Telegraph Co. Ltd.*

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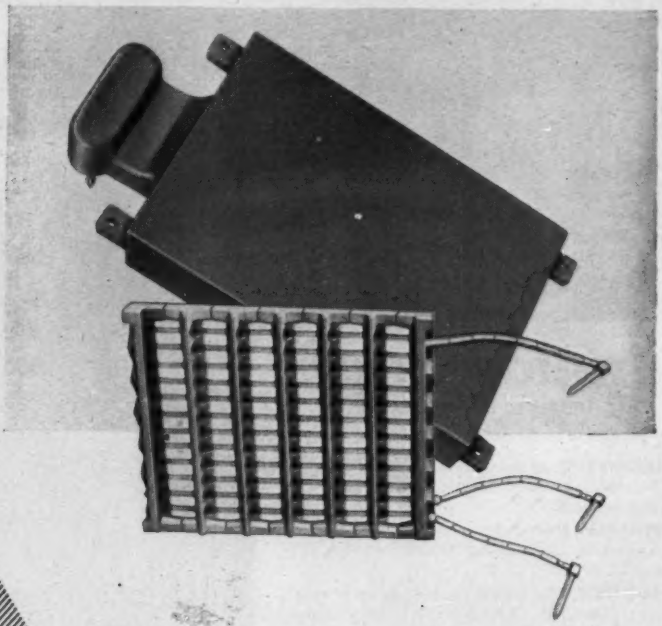

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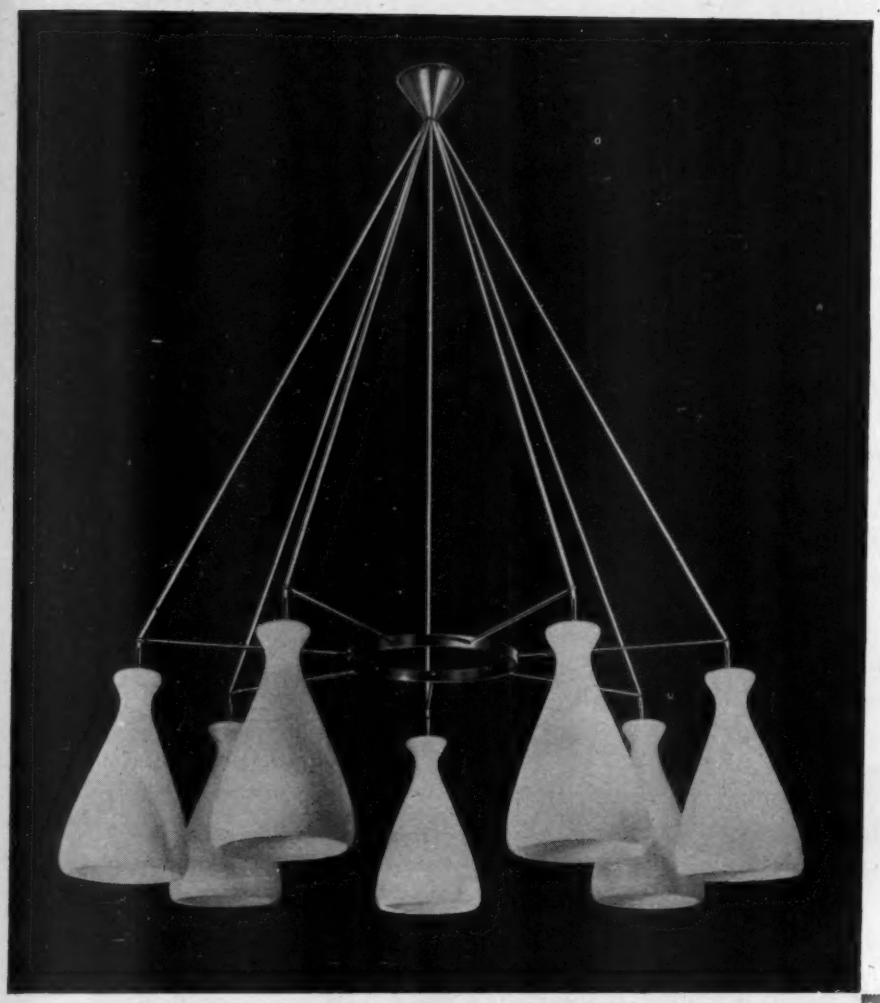

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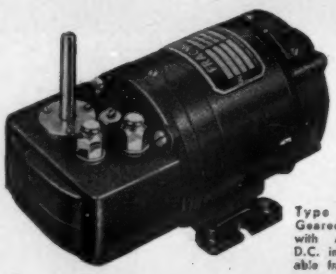

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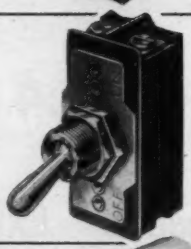

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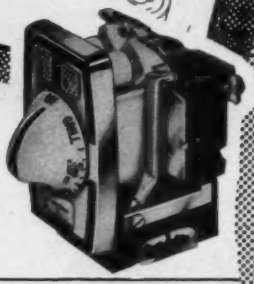

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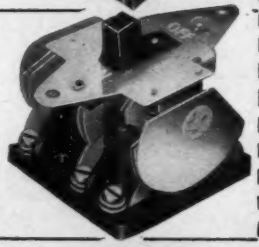

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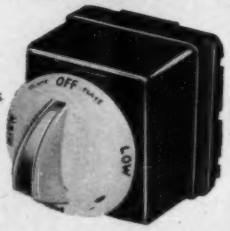


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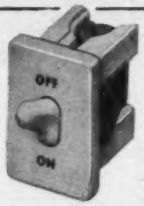


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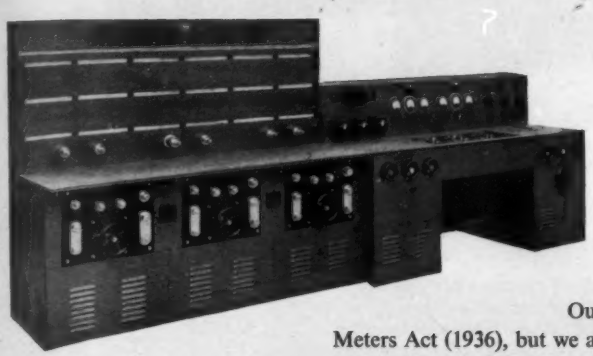

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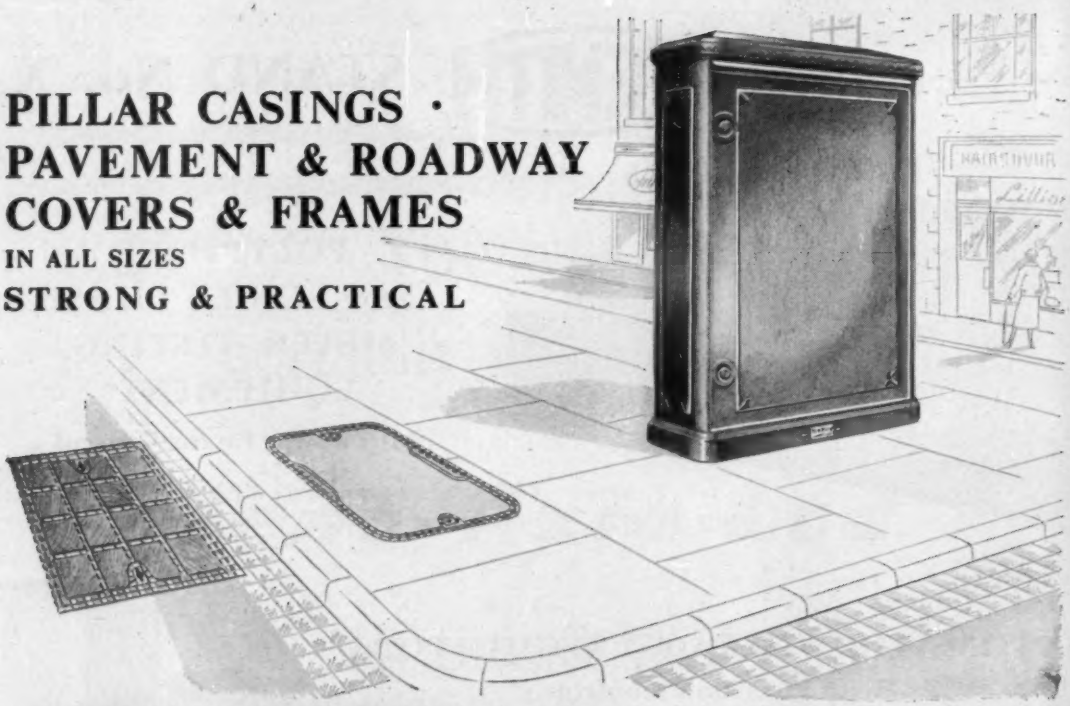

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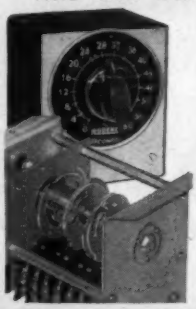

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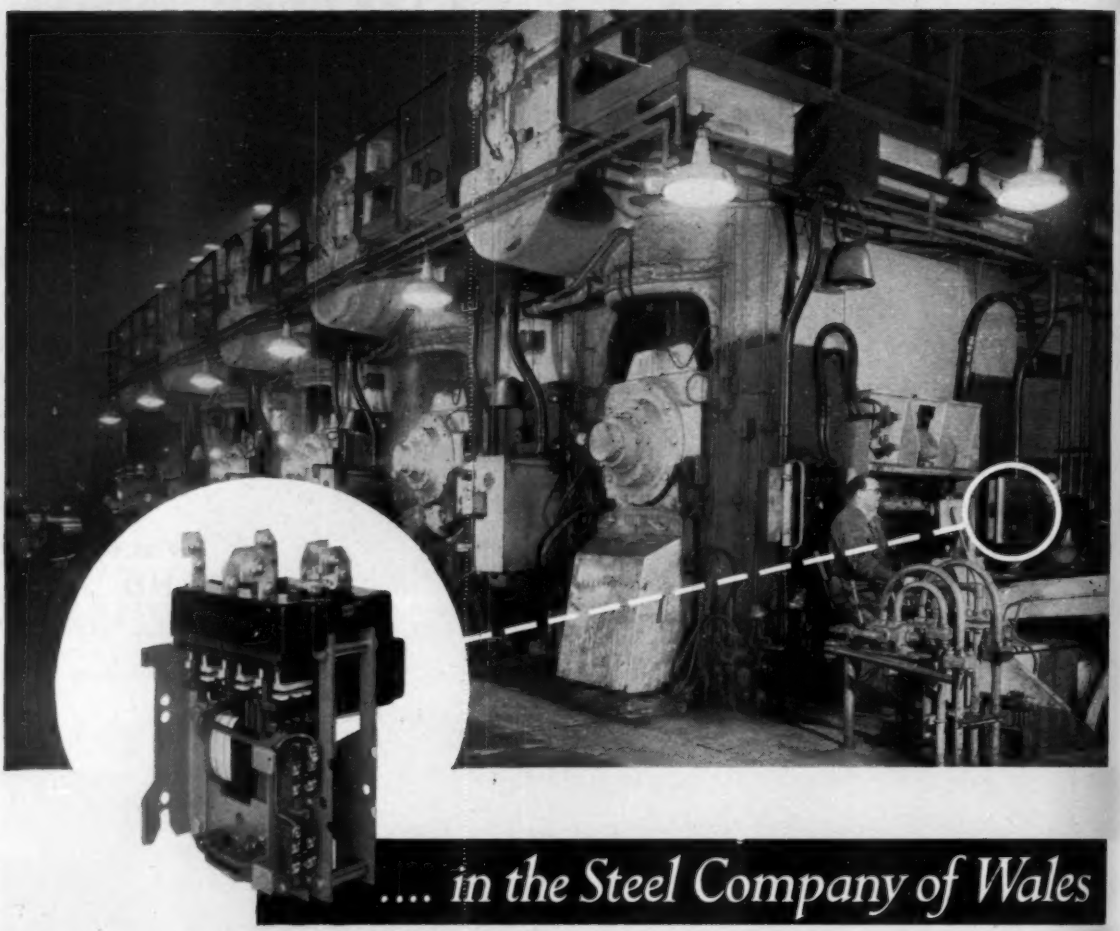

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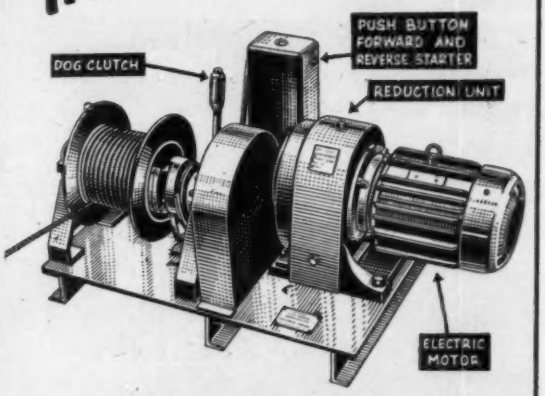


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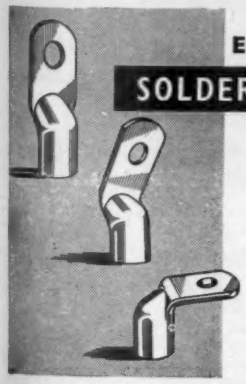

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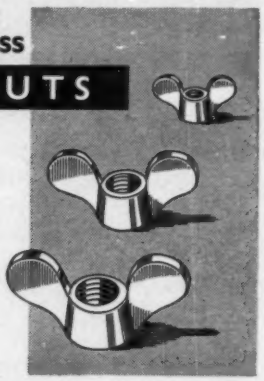

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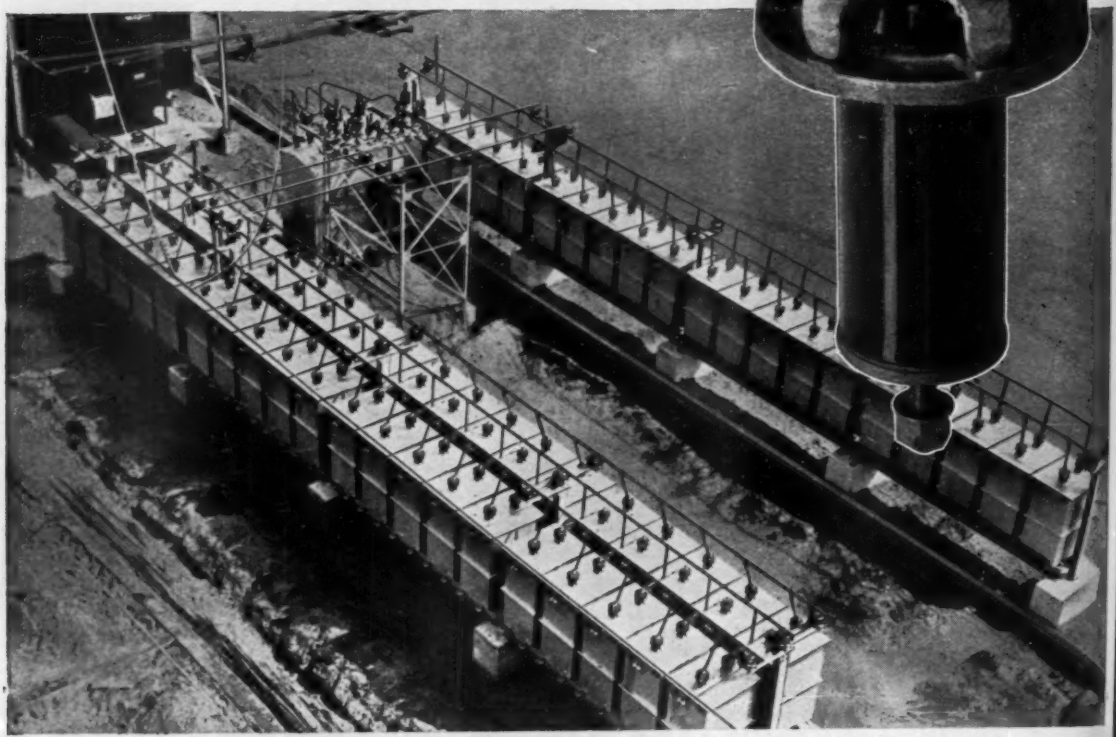

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One of the S.P.P. Range of Standard Transformer Bushings Type A55 was used on the B.I.C.C. capacitors forming this large 15,000 kVAr bank installed on the supply system of the Shawinigan Water & Power Company.

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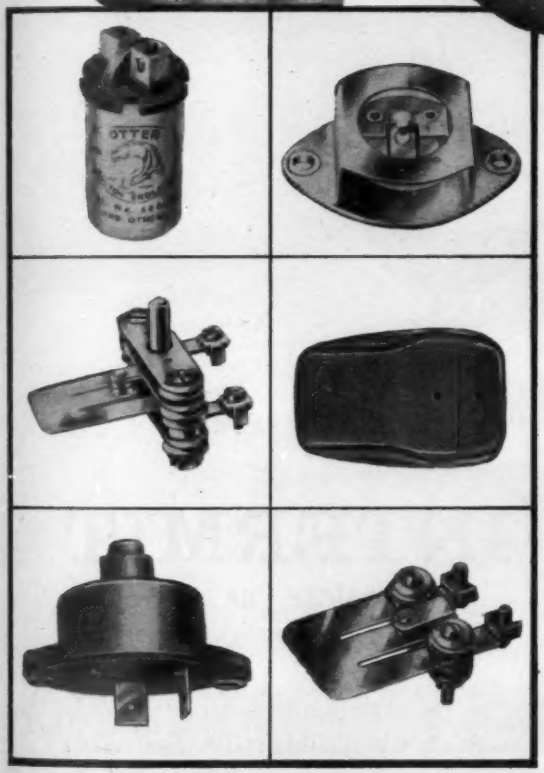

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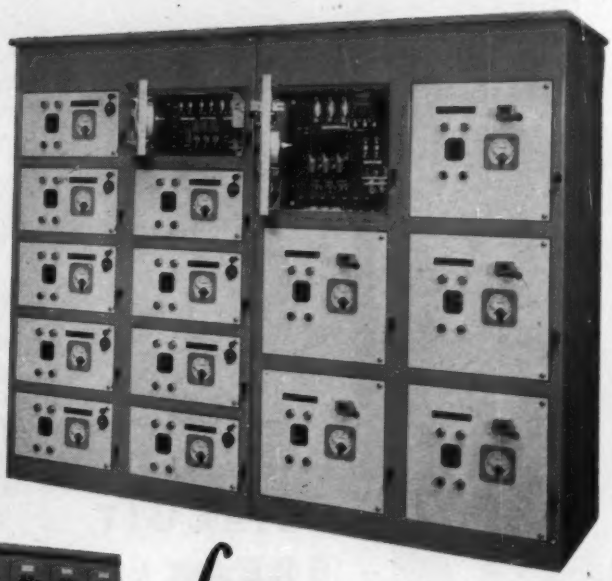

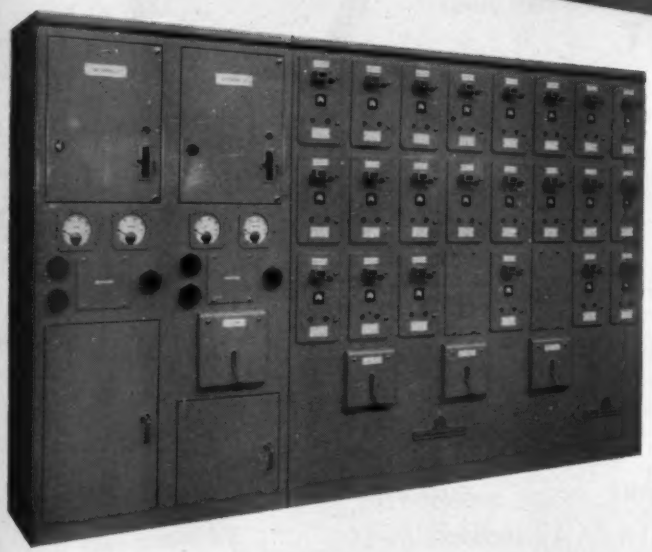

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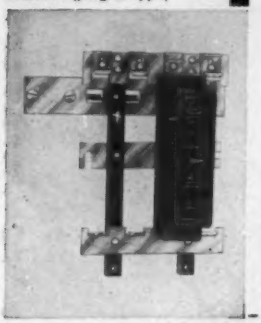

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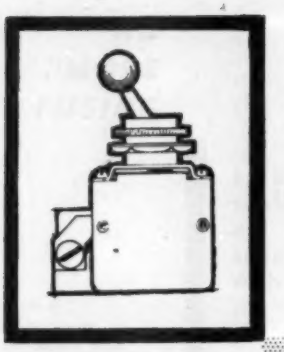
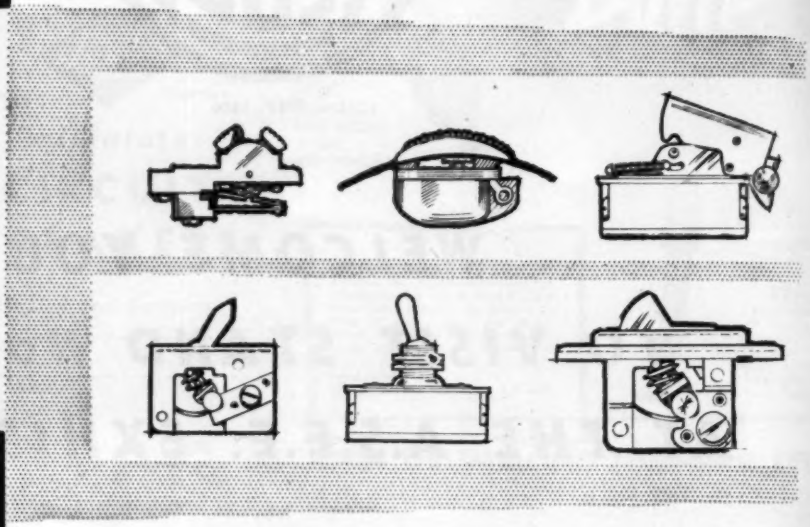


# SWITCHES



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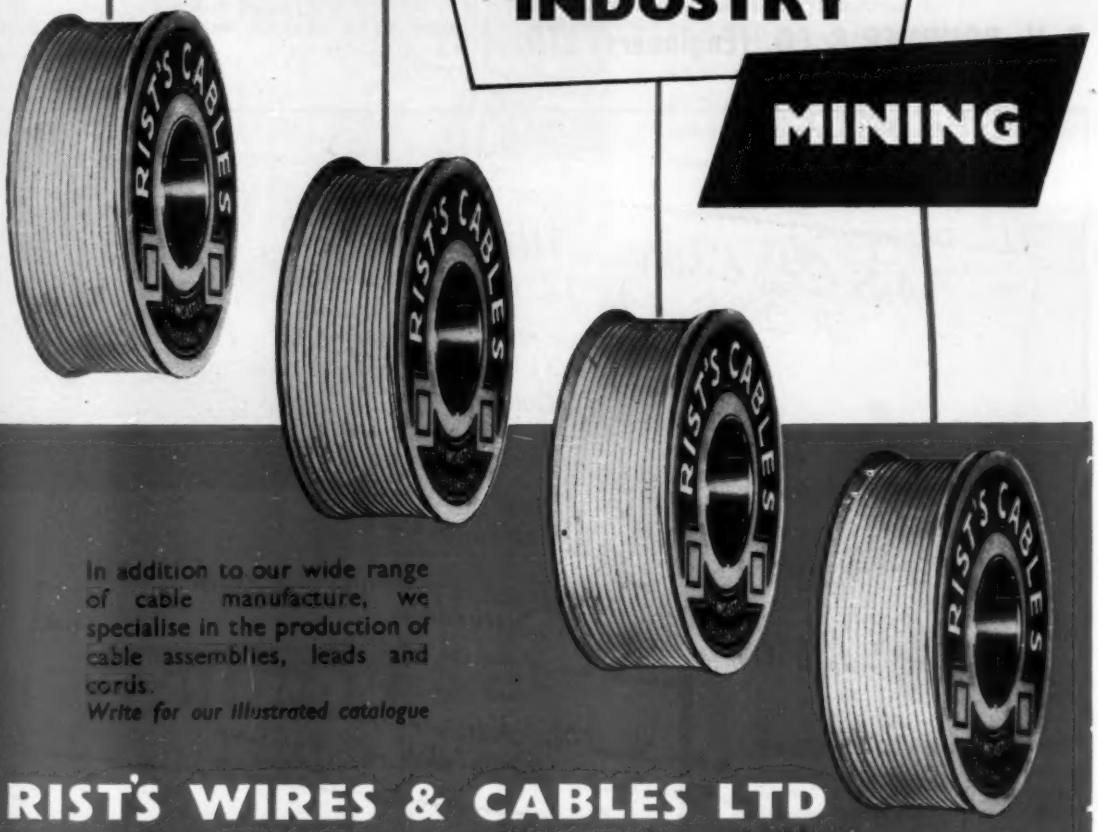


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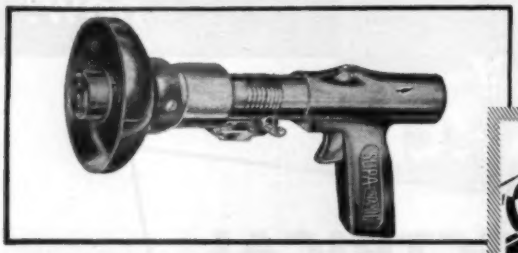

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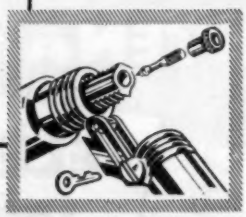

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*A.S.E.E. Exhibition—March 25th—29th, 1958*

*The Directors of M.T.E. Control Gear Limited request the pleasure of your Company at a*

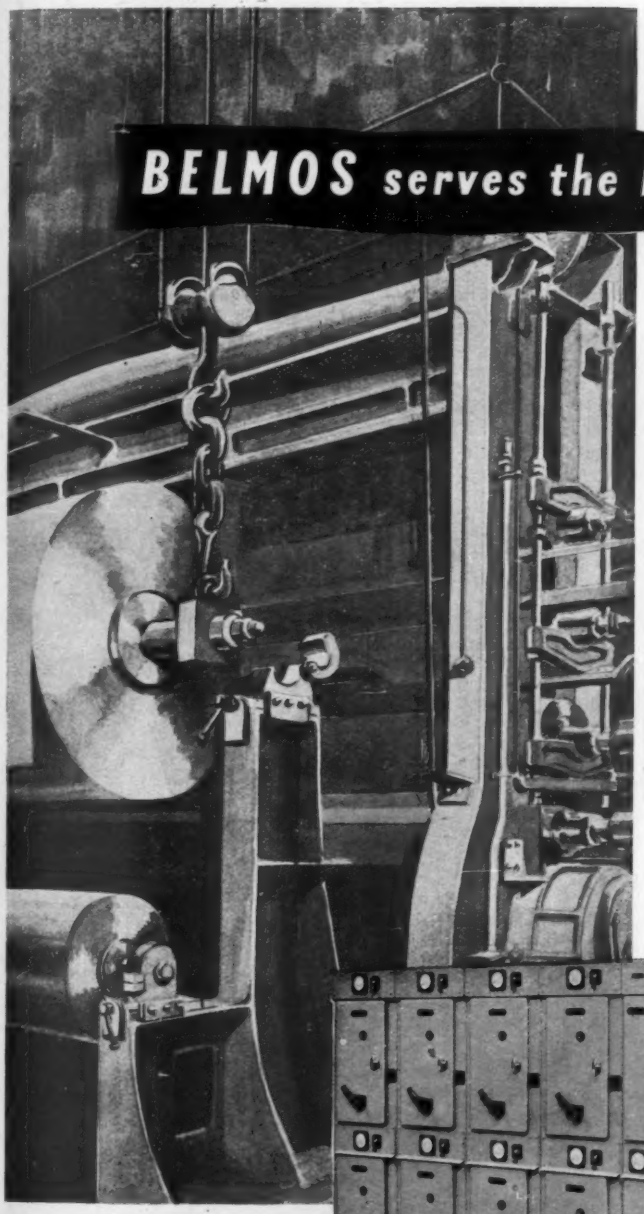
*Special Demonstration of Control Panel Assembly and Manufacture*

*to be held at their Stand No. Y10, on the First Floor at Earls Court from*

*Tuesday, March 25th to Saturday, March 29th, 1958*

*between the hours of 10.0 a.m. and 7.0 p.m. and*

*to their Stand No. K21, on the Ground Floor where the new M.T.E. "Discmag" Brake will be demonstrated*



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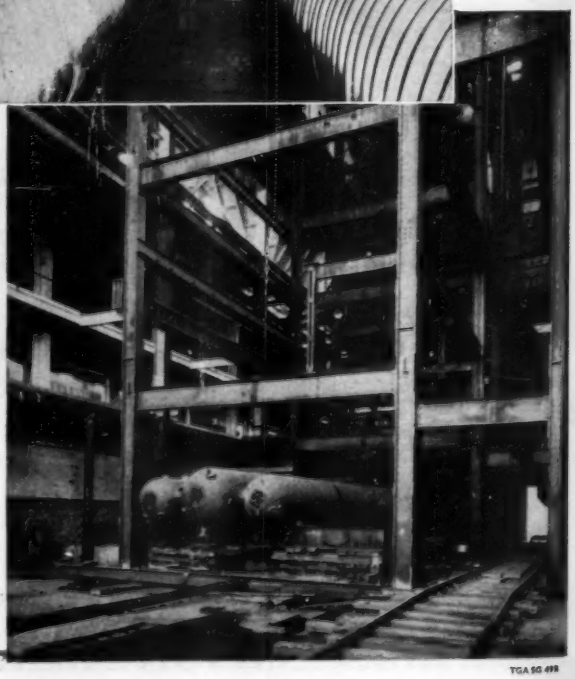

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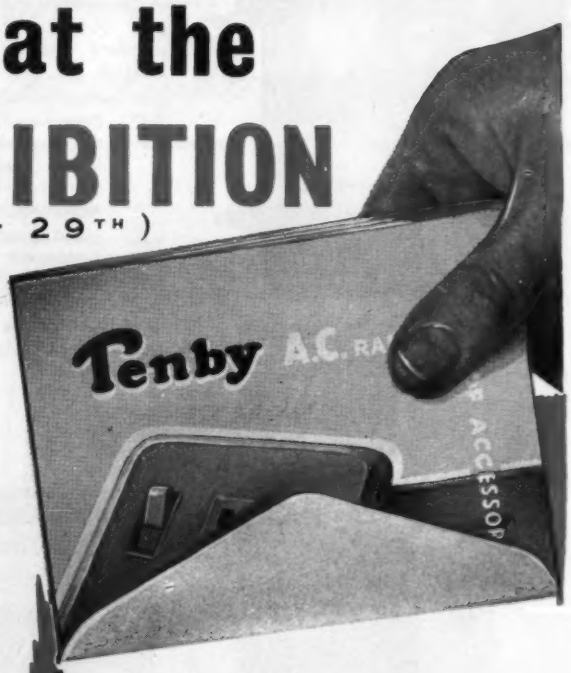
# THE *NEW* Tenby

## A.C. range of accessories on display at the A.S.E.E. EXHIBITION

(MARCH 25TH — 29TH)

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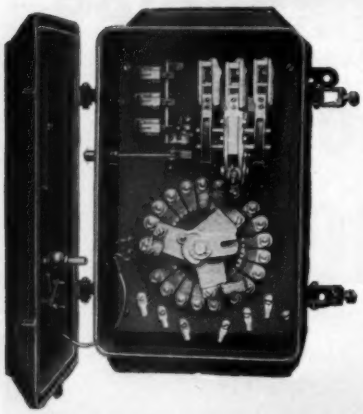

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30 h.p. 400/440 volts, 3-phase, 50 cycles A.C.

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All starters are available with or without isolators and with either magnetic or thermal overload relays as preferred.
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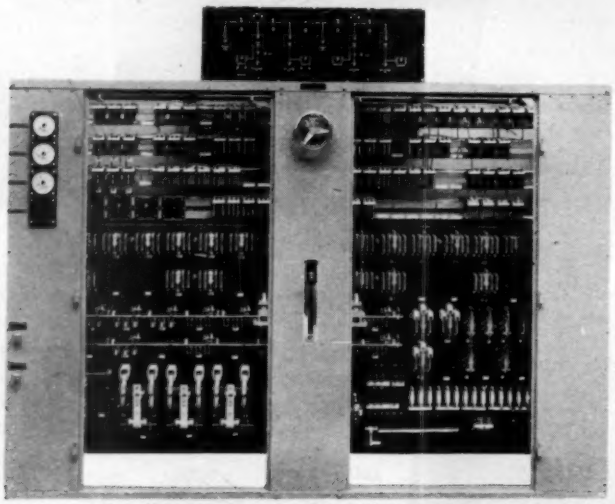
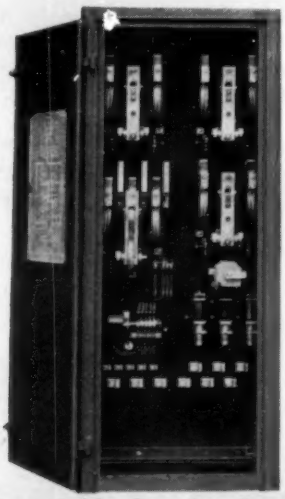


A multi-motor control cubicle with minic diagram for automatic control of a printing press



Automatic 4-Step Stator-Rotor Starter
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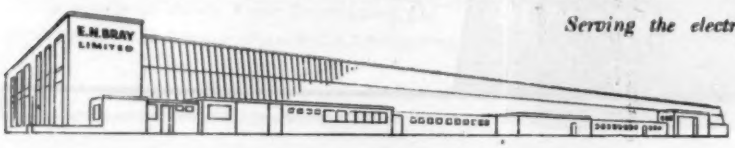

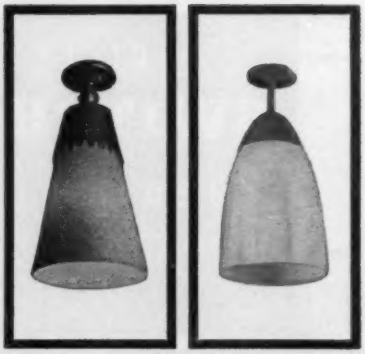

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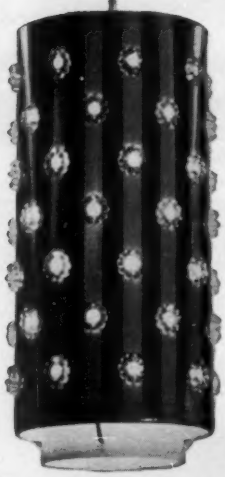
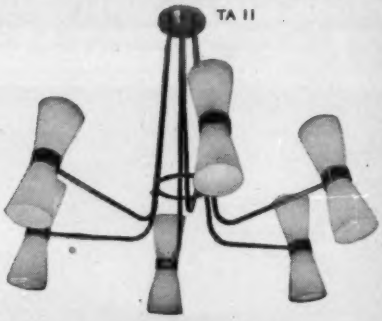


TA 64



TA 11

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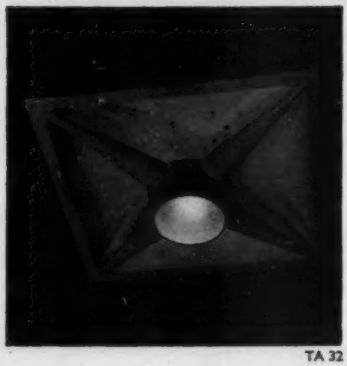

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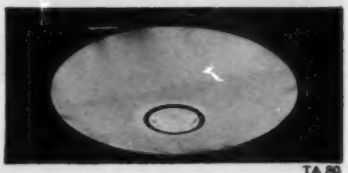

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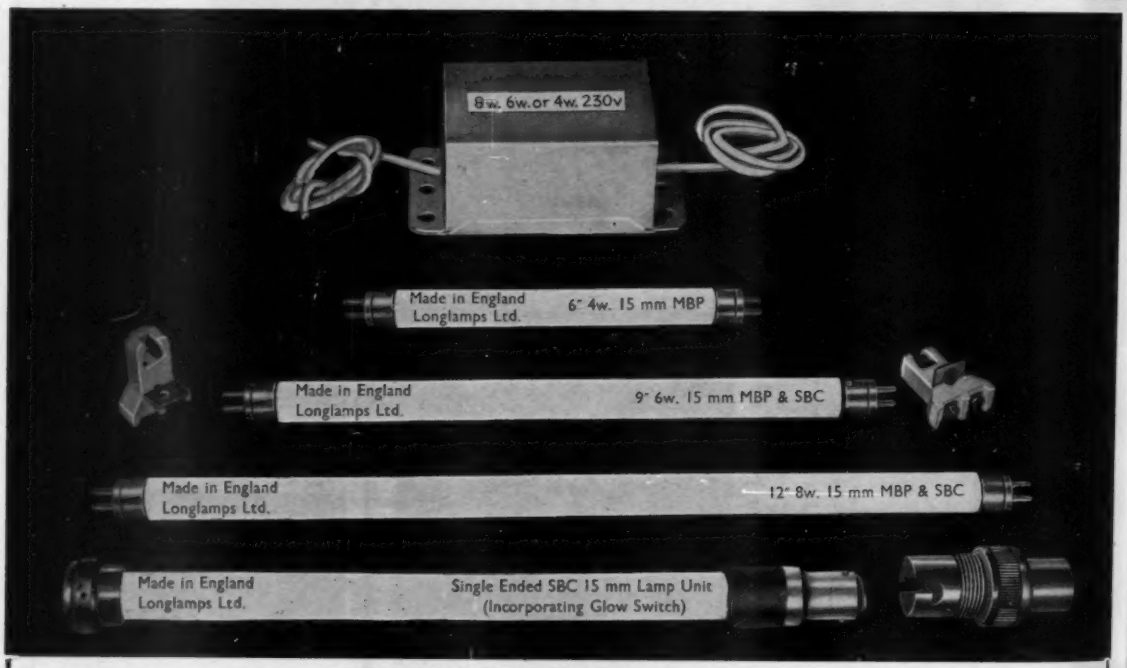
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**Electrical Engineers Exhibition, Earls Court**

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*These Accessories are also available in cream. Please write for catalogue showing complete range.*

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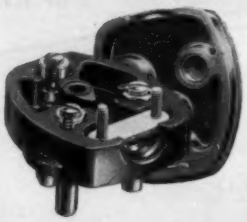

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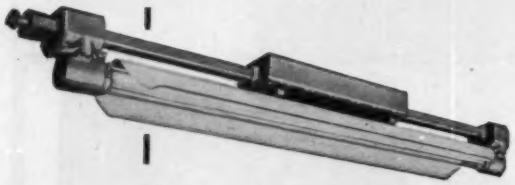
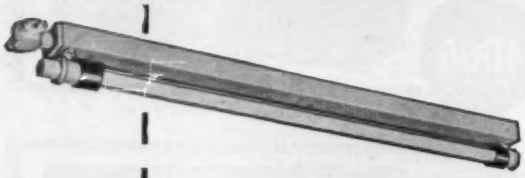
A·E·I
Lamp and Lighting Co Ltd

# New 'Proof' lighting

## see these new fittings on Stand J12
## A.S.E.E. Exhibition



**Flameproof.** For Groups I, II and III gases, Buxton certified. Ingenious design simplifies the removal of the protective, toughened glass cylinder for lamp replacement. There are two types, for top entry or for end entry (illustrated). Both can be used with or without reflector. For one 80 w. fluorescent lamp.



**Dustproof.** For underground mines' roadways and other dusty situations. Sturdily built and arranged for easy lamp replacement from one end, the fitting is available in two types, for 'T' entry (illustrated) or for 'through' entry. A reflector is available if required. For one 80 w. fluorescent lamp. Switch start only.

**Watershed.** Protected from condensation from above by sealed PVC or 'Perspex' reflector. Two types of fitting are available: the Anti-corrosion Watershed (illustrated) for chemical works, plating shops, dye works; the Standard Watershed for laundries, pit-head baths and other non-corrosive atmospheres of high humidity. For one 80 w. fluorescent lamp.

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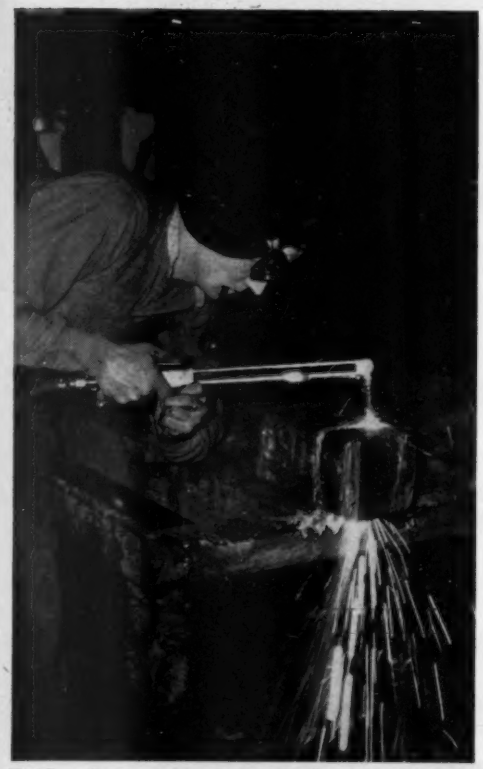

*The "Demon" cutting steel plate at the works of Samuel Fox & Co. Ltd.*

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From the point of view of general all-round capability, the "Demon" Cutting Blowpipe has no equal in its field. The latest addition to the Sifbronze range of welding equipment, it has the exceptional feature of a cutting range of 10 inches.

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*The "Demon" Cutting Blowpipe will be on display with the rest of the Sifbronze range of welding rods and equipment at STAND No. T23, at the Electrical Engineers Exhibition*

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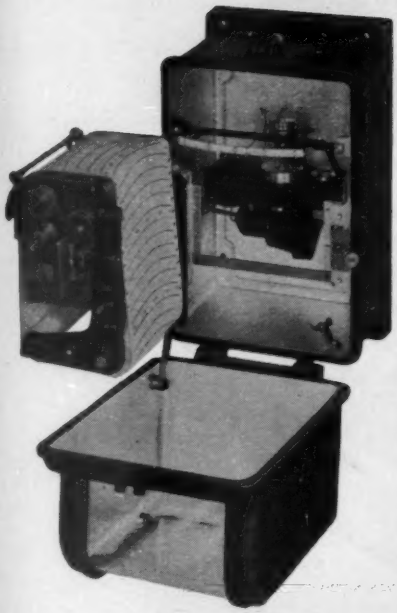

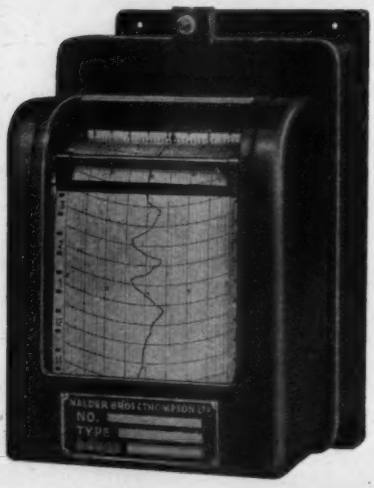

Nalders Graphic Recording Instruments illustrated at left and below, show the Standard and Duplex models, switchboard pattern. Picture on extreme left shows the simplicity of opening the instruments for recharting. A complete range of recording instruments, for both switchboard and portable patterns, is offered for all meters.

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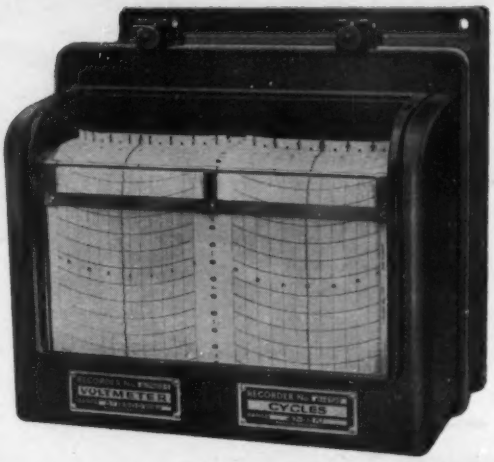


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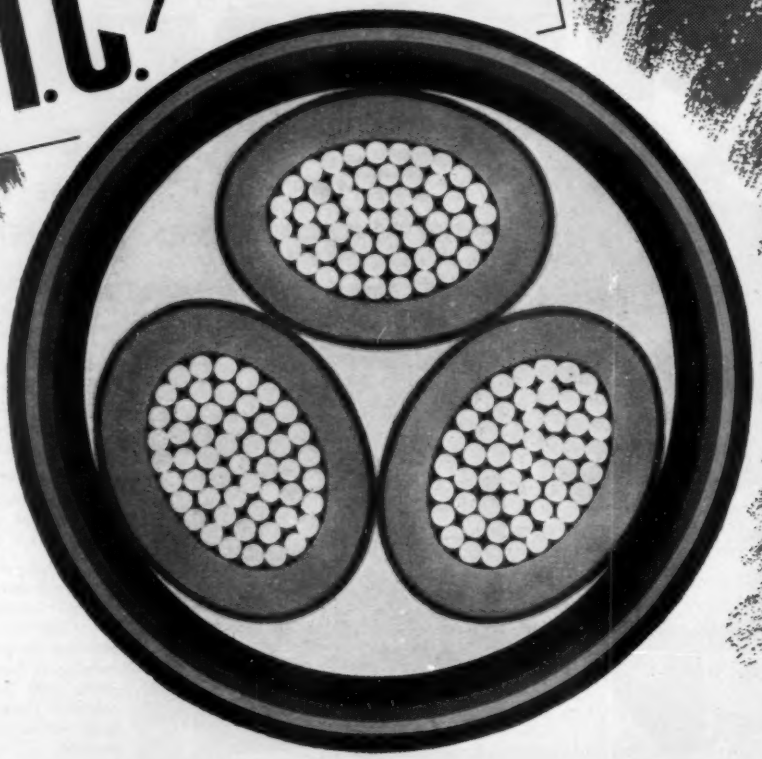

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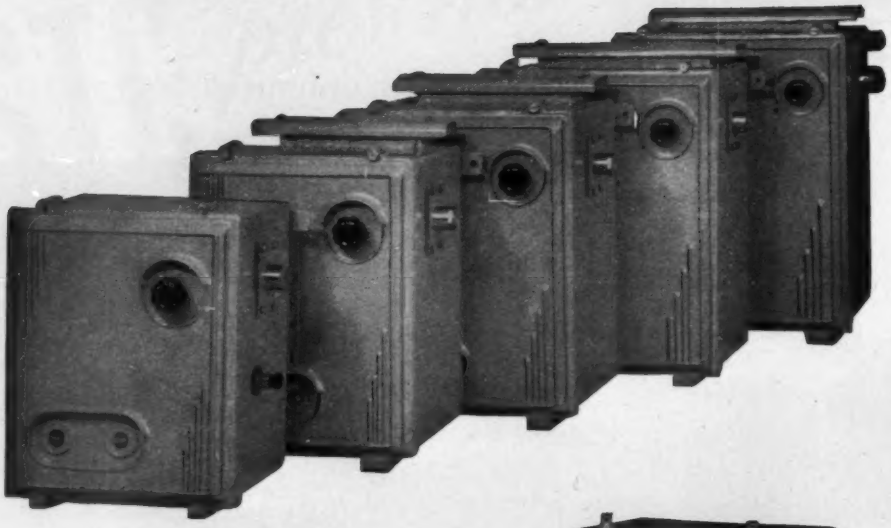

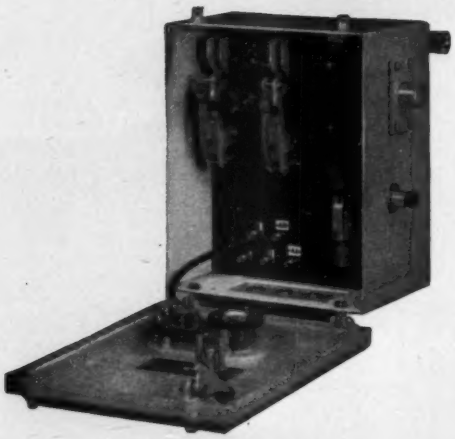

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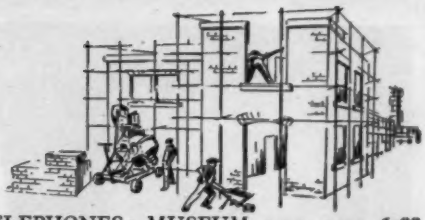

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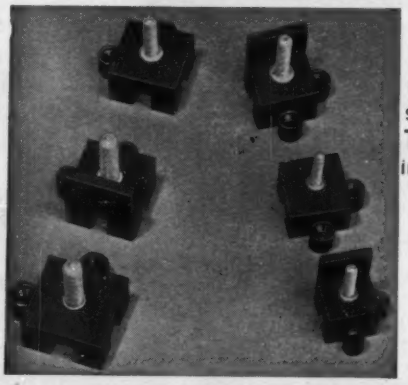

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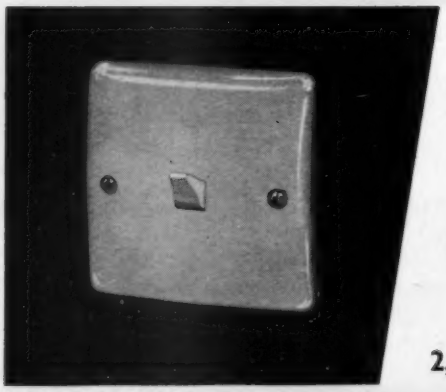

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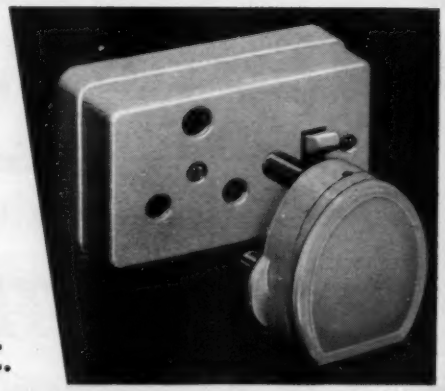

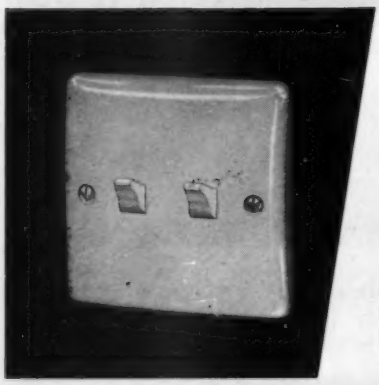

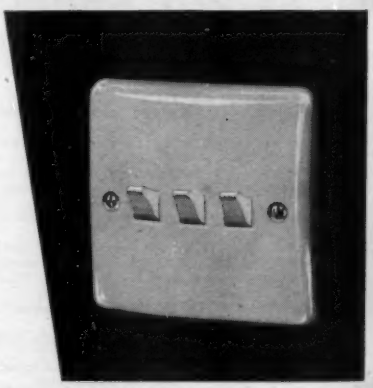

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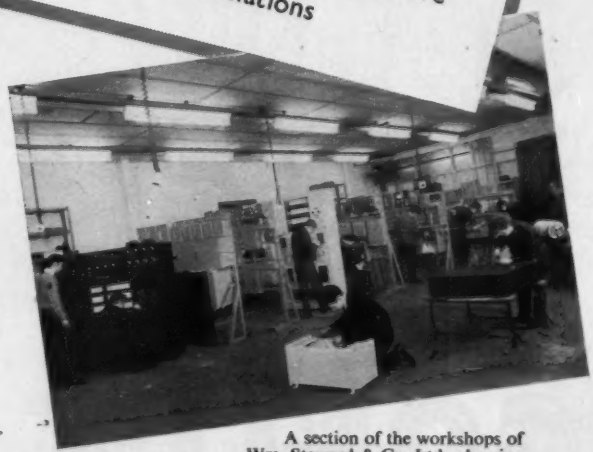

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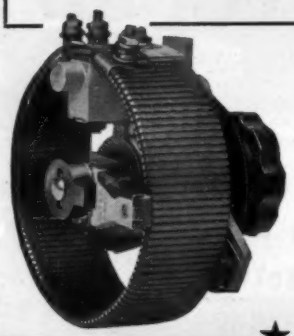

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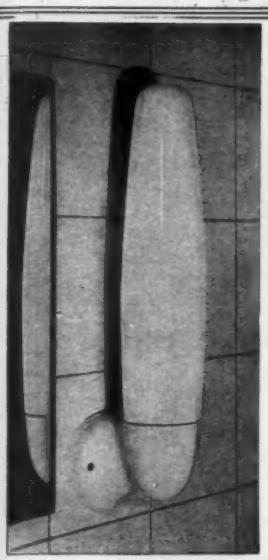

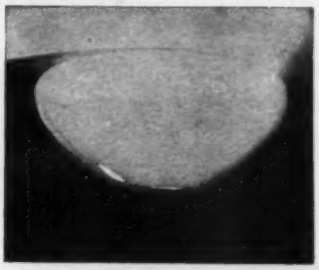

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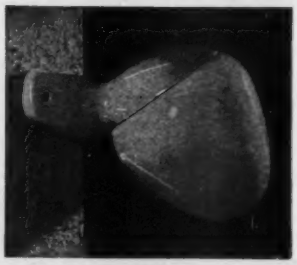

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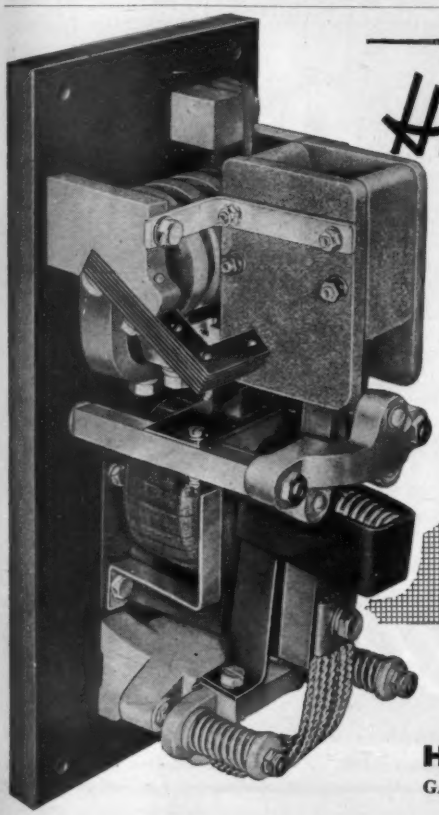

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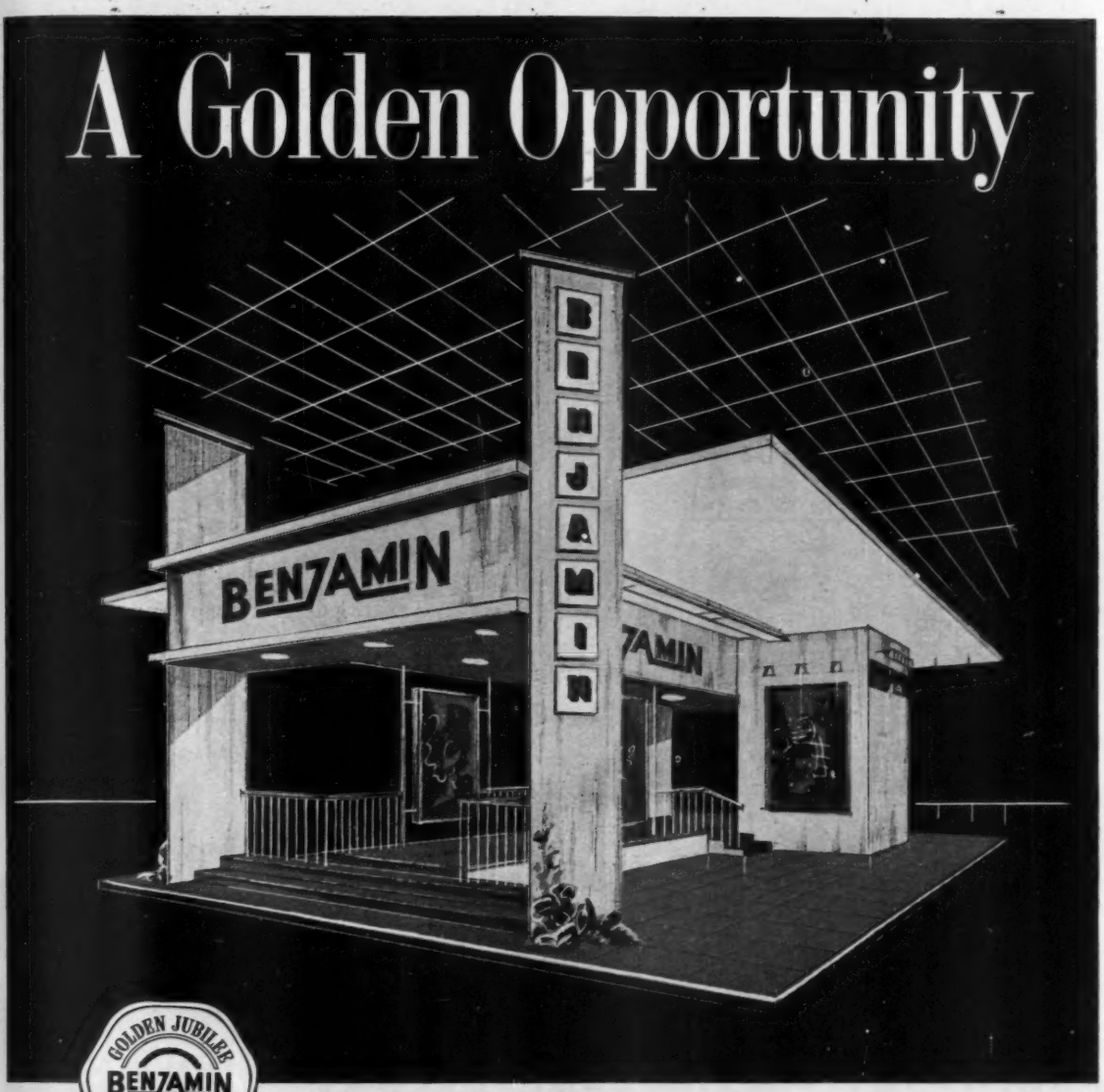


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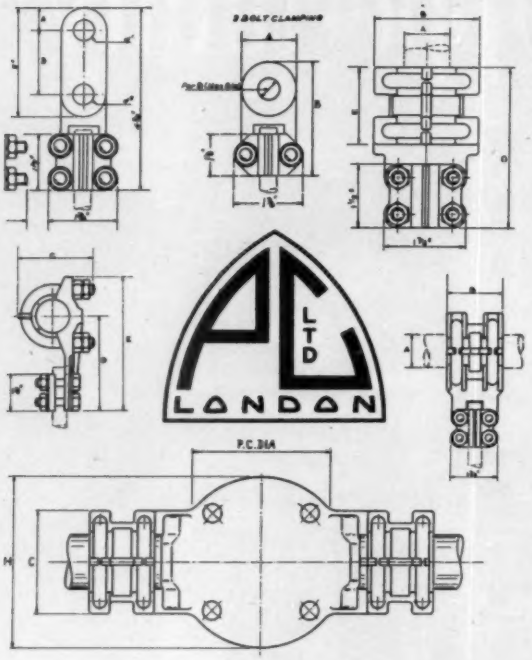


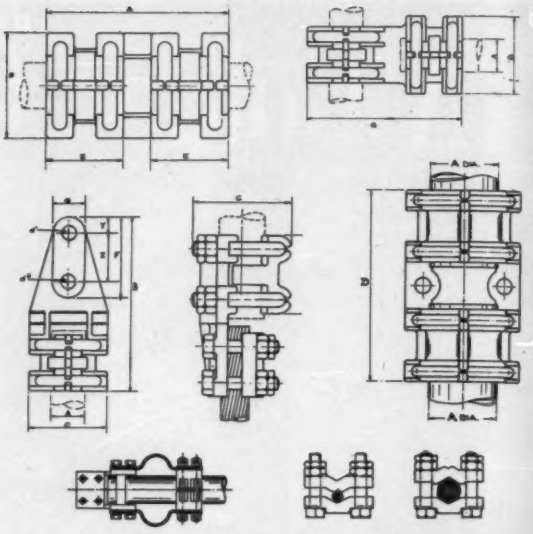

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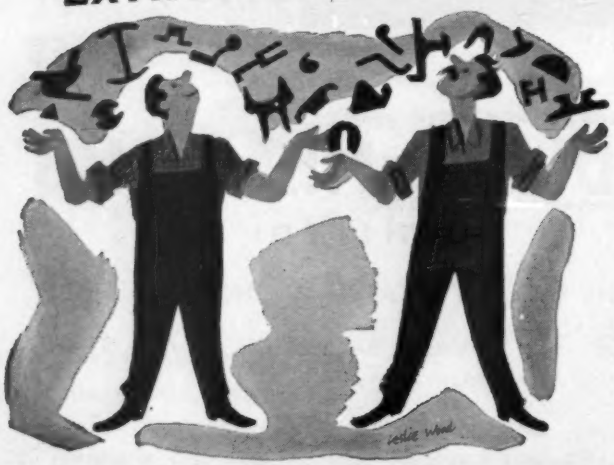

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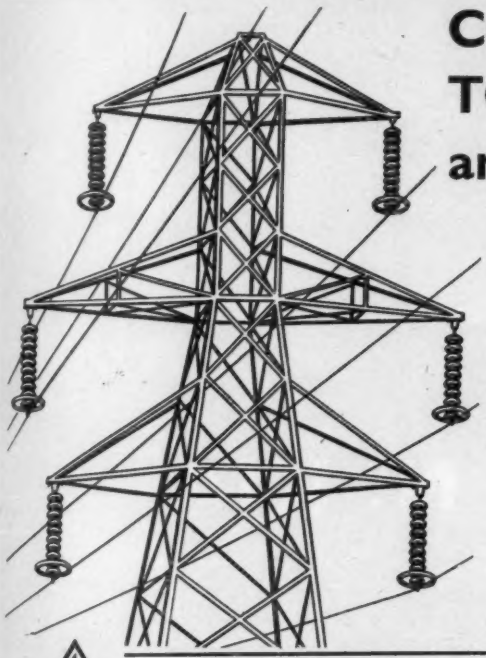

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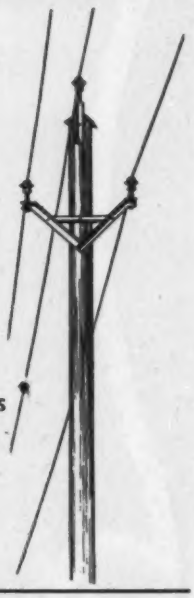

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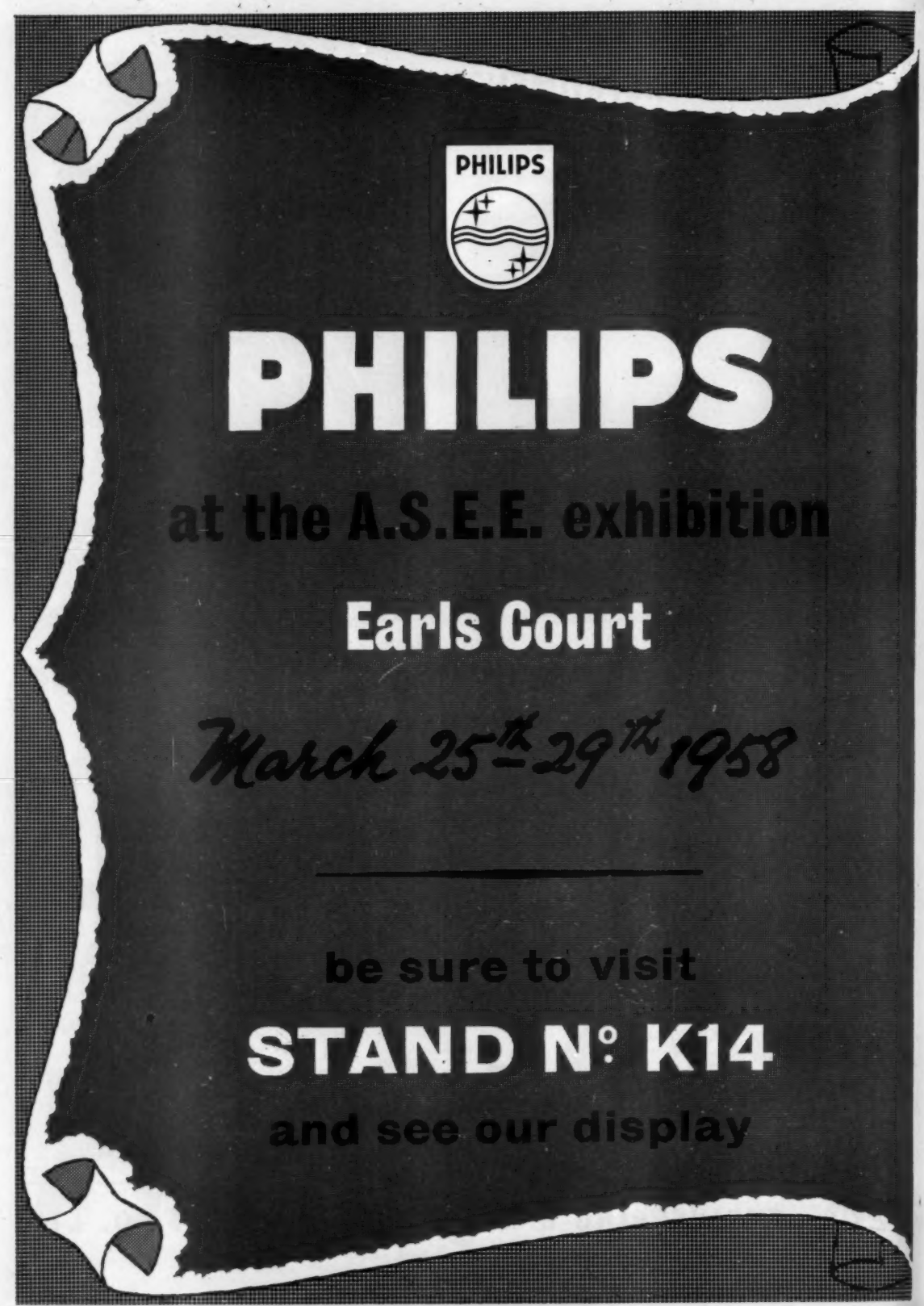
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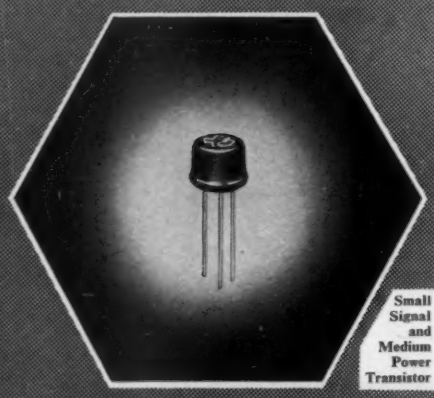
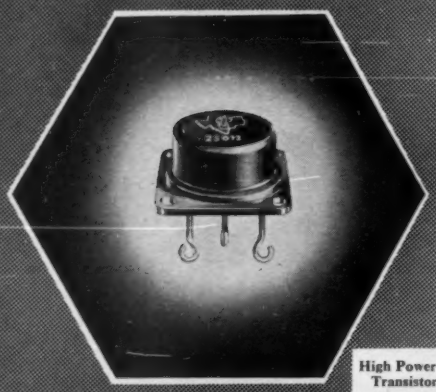


Small Signal and Medium Power Transistor



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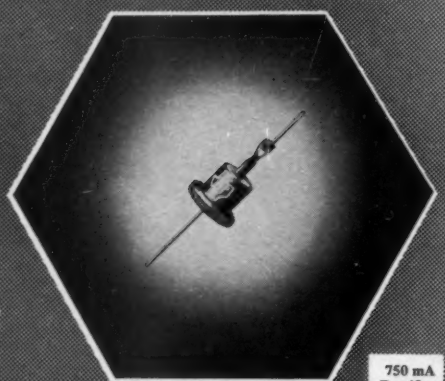

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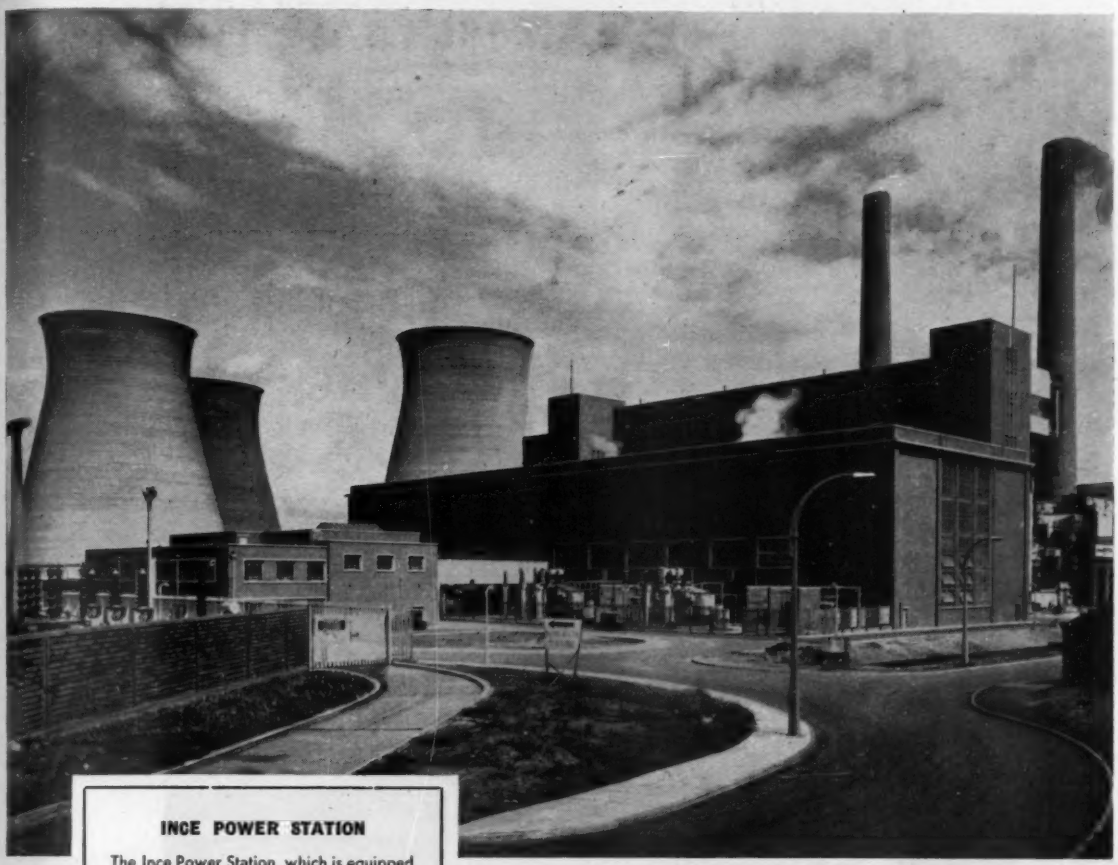

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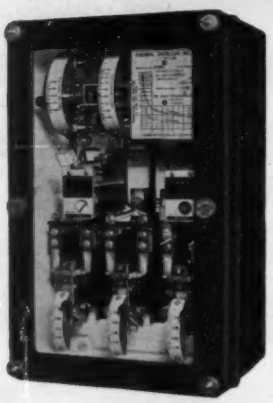

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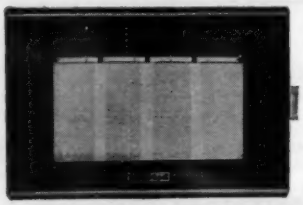

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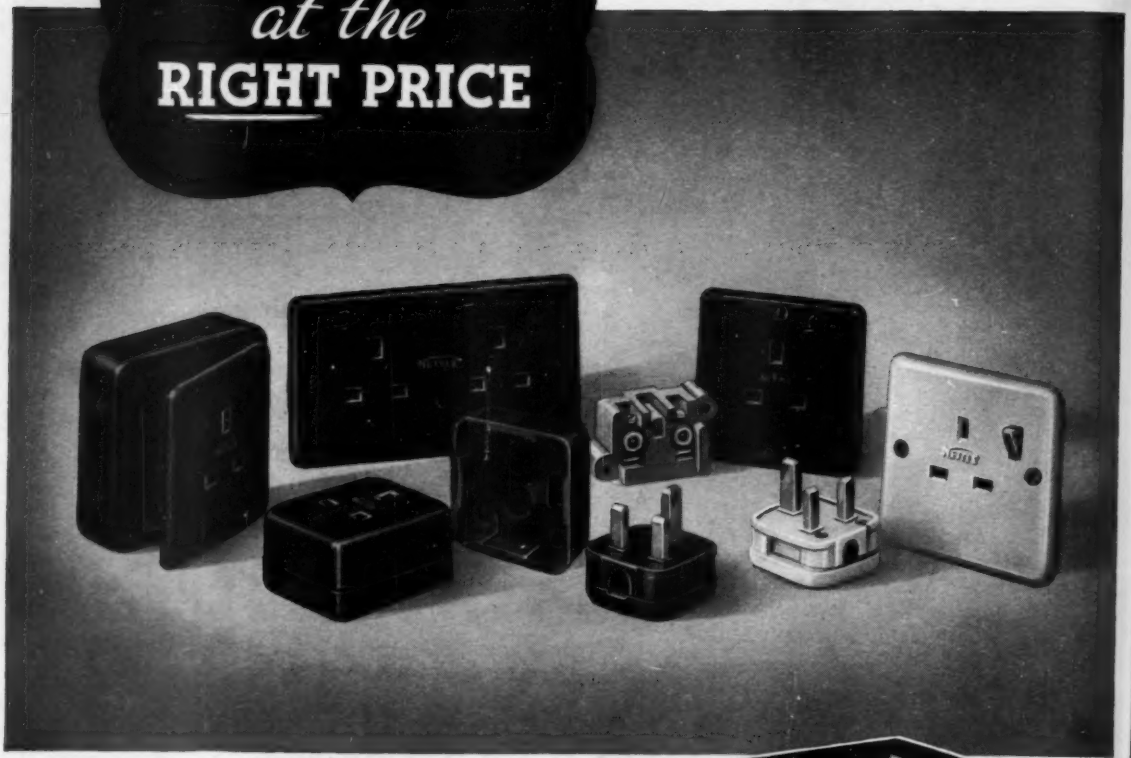

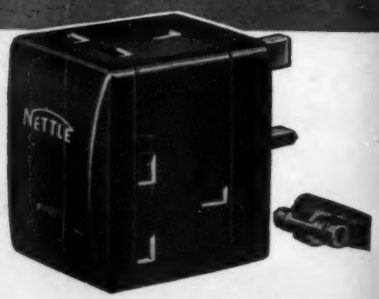


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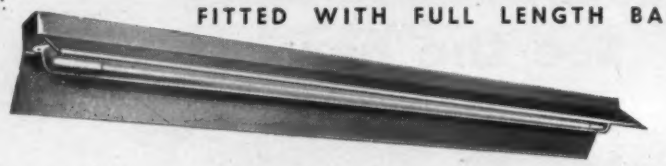

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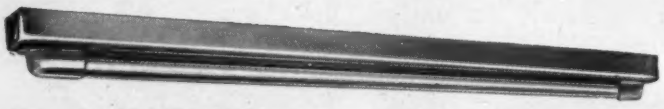

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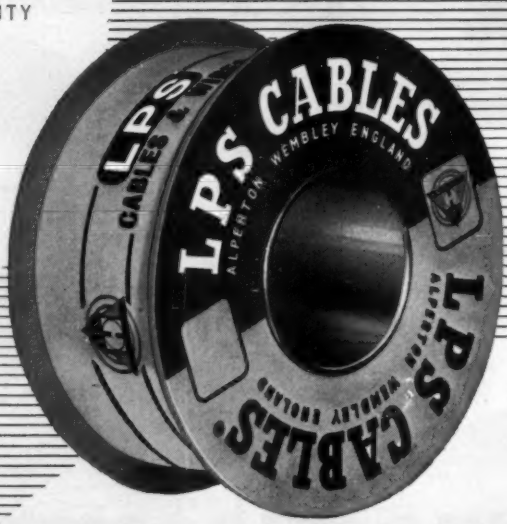


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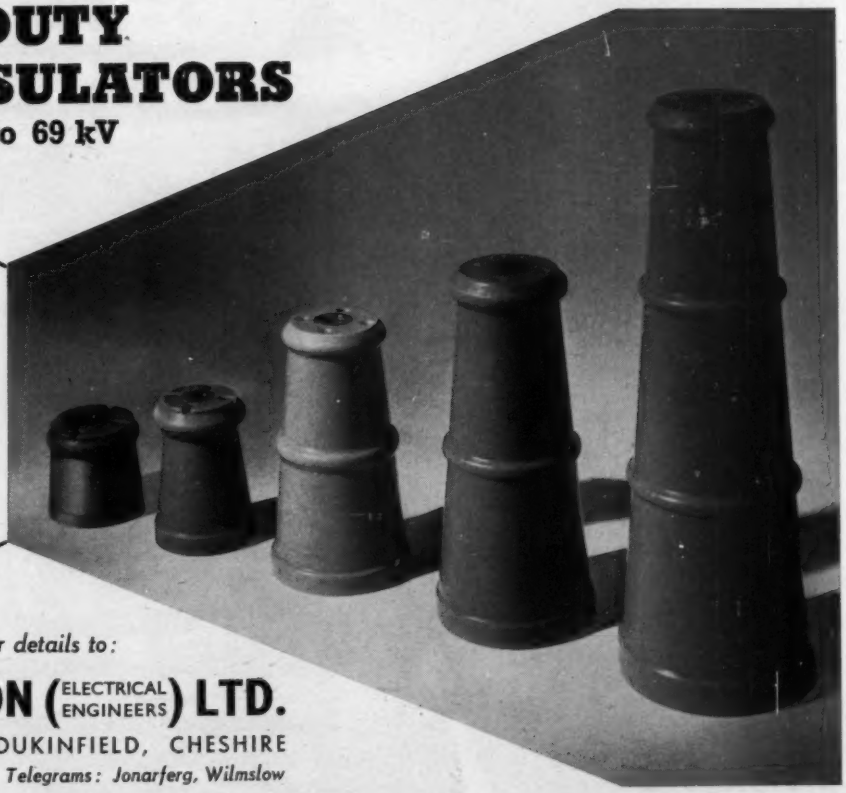

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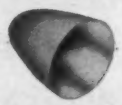

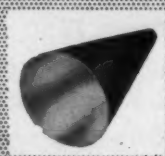

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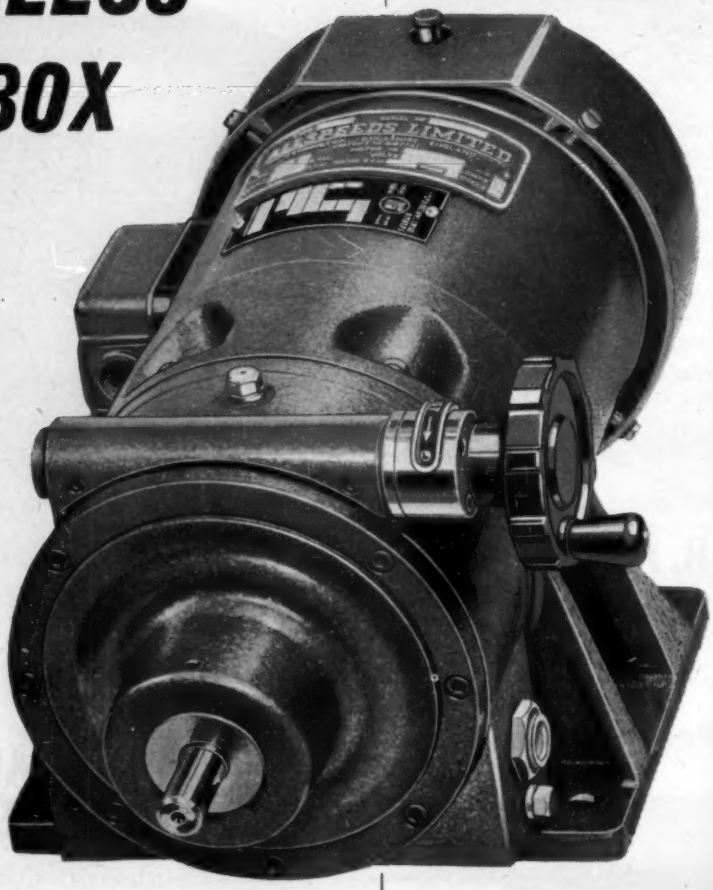


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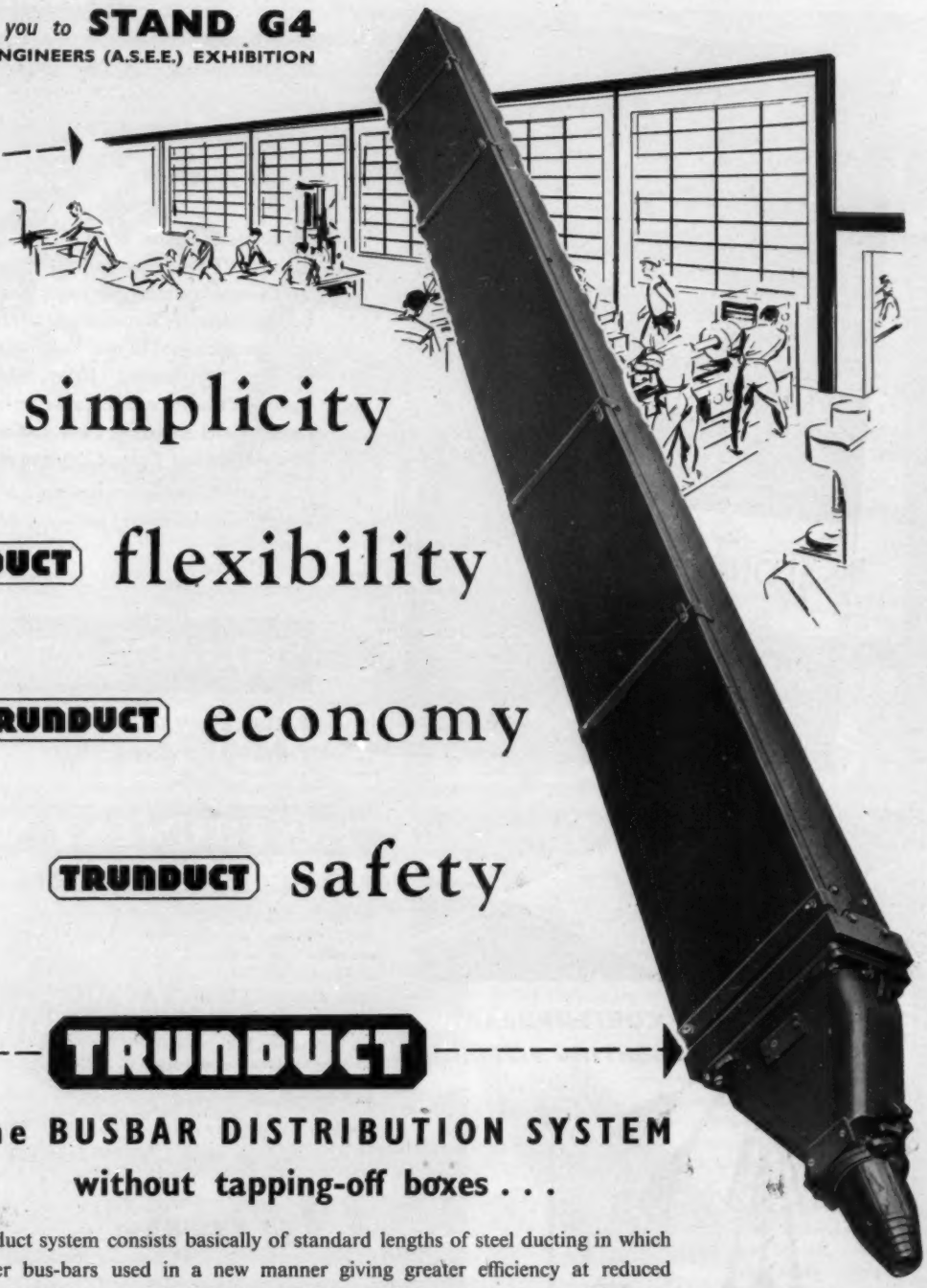

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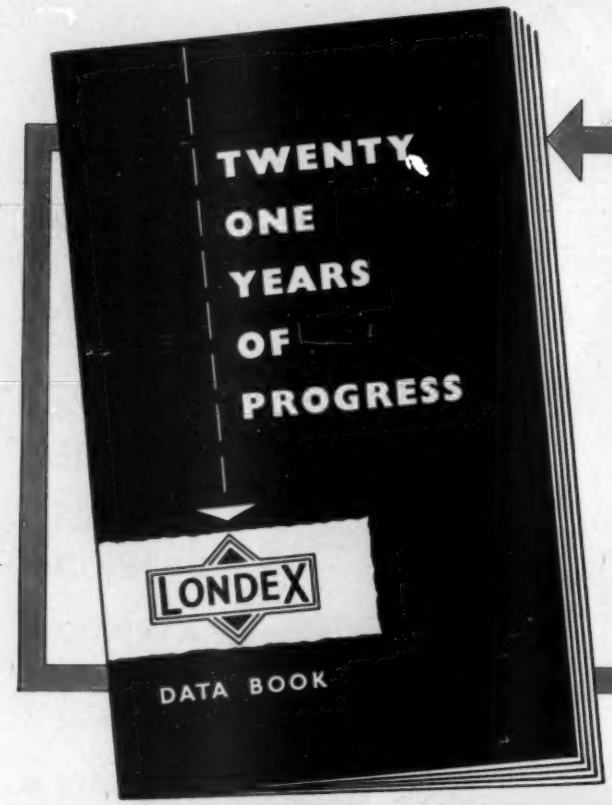


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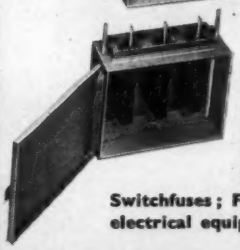

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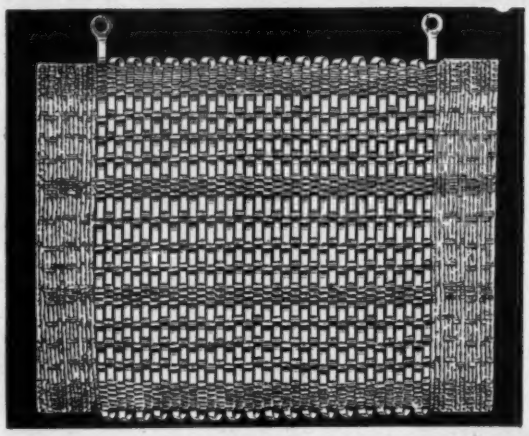

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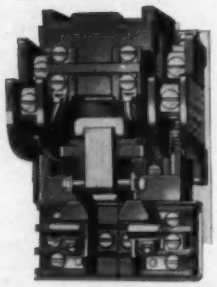

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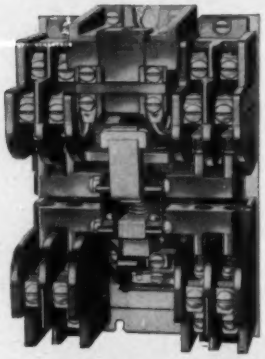

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*Telephone: Port Talbot 791*
Electrical Engineers and Contractors
Rewinds and Repairs. Industrial Installations

. . . for all electrical installations
**F. H. WHEELER & CO. LTD.**
**117 Woodville Road, Cardiff**
*Telephone 21281-2* *Telegrams: "Wheelect"*

**CLARKE BROS. (Stroud) LTD.**
**High Street, Merthyr Tydfil**
*Telephone: Merthyr Tydfil 377*
Electrical Engineers and Contractors
Rewinds and Repairs. Industrial Installations

**MERSEYSIDE & N. WALES**

**TROUGHTON & YOUNG LTD.**
**46 Rodney Street, Liverpool 1**
*Telephone: Royal 9231-2*
Electrical Engineers and Contractors

**H. J. CASH & CO. LTD.**
**28 Chapel Street, Liverpool 3**
*Telephone: Central 0452*
Electrical Engineers and Contractors

**YORKSHIRE**

Electrical Engineers and Contractors
**SOUTHERN & REDFERN LTD.**
**Woodhead Road, Bradford 7**
Textile Maintenance, Repairs and Rewinds
*Telephones: Bradford 23871—Late Phone: Bradford 65837*

**DALE ELECTRIC (YORKSHIRE) LTD.**
**Filey, Yorks. Also at Malton and Driffield**
*Telephone: Filey 2301 (3 lines)*
Electrical Contractors and Manufacturers
Estimates given for all types of electrical installations without obligation

**EDMUNDSONS CONSTRUCTION CO. LTD.**
Electrical Engineers and Contractors
**2 Hartley Hill, Leeds 2**
*Telephone: Leeds 33791*

. . . for all electrical installations
**F. H. WHEELER & CO. LTD.**
**44 Bank Street, Sheffield 1**
*Telephone 24015 (3 lines)* *Telegrams: "Wheelect"*

. . . for all electrical installations
**F. H. WHEELER & CO. LTD.**
**Paver Lane, York**
*Telephone: York 23172*

**NORTH WESTERN**

**STEWART THOMSON & SONS (Liverpool) LTD.**
**Fort Road, Seaforth, Liverpool 21**
Repairs and Rewinds A.C. and D.C. to 3,000 horsepower. Breakdowns, Urgent Repairs, etc. 24-hour service
*Telephone: Bootle 2697-8*

. . . for all electrical installations
**F. H. WHEELER & CO. LTD.**
**Regal Buildings, Oxford Road, Manchester 1**
*Telephone: Central 8207-8*

Industrial Installations
**W. H. SMITH & CO. ELECTRICAL ENGINEERS LTD.**
**12 York Street, Manchester 2**
*Telephone: CENtral 2991-6*
Works: Praed Road, Trafford Park, Manchester 17

**THE NELSON ENGINEERING CO. LTD.**
*Telephone: Nelson 1545/6*
Electrical and Mechanical Engineers.
Complete Industrial Installations. Rewinds
**Netherfield Road, Nelson**

**H. J. CASH & CO. LTD.**
**28 Chapel Street, Liverpool 3**
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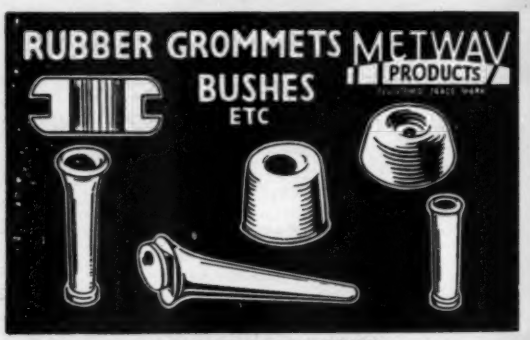
**NORTH EASTERN**

**DALE ELECTRIC (YORKSHIRE) LTD.**
**Filey, Yorks. Also at Malton and Driffield**
*Telephone: Filey 2301 (3 lines)*
Electrical Contractors and Manufacturers
Estimates given for all types of electrical installations without obligation

. . . for all electrical installations
**F. H. WHEELER & CO. LTD.**
**52 Elswick Road, Newcastle**
*Telephone: Newcastle 36271*

Applications for particulars of costs and standard style of advertisements in this Regional Guide should be addressed to :

THE
ADVERTISEMENT DEPARTMENT,
ELECTRICAL REVIEW,
DORSET HOUSE, STAMFORD STREET,
LONDON, S.E.1

Send for Catalogue No. RGL/1/ER
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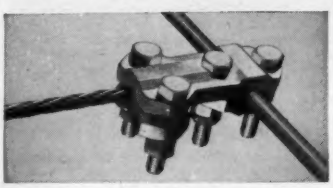
**Solderless UNIVERSAL CONNECTORS**
FOR ALL CONNECTIONS AND TYPES OF CONDUCTORS
**BRITISH SWITCHGEAR CORPORATION LTD.**
MAKERS OF H.T. SWITCHGEAR
**Morden Factory Estate, London, S.W.19**
**LIB 2273-5**

*See us on*

# STAND Nº A1

**A.S.E.E. EXHIBITION, EARLS COURT**

*March 25th-29th, 1958*

Aeroflex

AEROFLEX Fluvent

**A comprehensive exhibit showing the latest developments in Distribution equipment, from the heavy industrial to the domestic, which will be well worth your visiting.**

**We shall be particularly pleased to show you our Cabinet Style Distribution Boards with isolators and the latest Fluvent flush fronted Cubicle type Switchboards. See also the 100 kA breaking capacity 600 volt fuses to C.S.A. Approval Code 106 Form 1 and the wide range of Energy Limiting Aeroflex Fuse Links Categories AC4 and AC5, Class P.**

## *Parmiter Hope & Sugden Ltd*

**MANCHESTER 12**

*London:* 34 Victoria St., S.W.1. *Glasgow:* 5 Somerset Place, C.2. *Birmingham:* 39/41 Carrs Lane, 4



dm PH140

It's never too late
to see the
G.E.C.
about
**space heating**

Any time is the right time to see the G.E.C. about your heating; for the G.E.C. manufactures the widest range of industrial electric space heating equipment... to suit every type of industrial and commercial premises. And did you know the Company offers a free advisory service? Yes, the G.E.C. will plan schemes for you that add up to all-round economies... in layout, installation time and fuel consumption.

G.E.C.

# INDUSTRIAL ELECTRIC SPACE HEATING

**'Nightstor' heaters—**
*store by night, heat by day*

**overhead radiant heaters—**
*for economical and immediate warmth*

**unit fan heaters—**
*give an even flow of warmed air*

**Standard tubular heaters—**
*provide heat to measure from a wide selection of tube lengths*

*For further information, write for publication H5*

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

V 162 MR 21 58 UMI

# Classified Advertisements

**CLASSIFIED** advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

**DISPLAYED CLASSIFIED**:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

**SERIES DISCOUNTS** for consecutive insertions 1—18, 5%; 26, 10%; 52, 15%.

**SITUATIONS WANTED**:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

**REPLIES** to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

**ADVERTISEMENTS** are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

**Original testimonials should not be sent with applications for employment**

**EASTER**

Classified Advertisements for the issue of 4th April should reach us by FIRST POST on FRIDAY, 28th March

## OFFICIAL NOTICES, TENDERS, ETC.

### BOROUGH OF BATLEY

**Street Lighting Department**

TENDERS are invited for the supply of the following equipment :—

15-ft. Concrete Columns.
Swanneck Brackets complete with box and spigot.
Cast Iron Wall Boxes.
Lanterns for 150-watt Tungsten Lamps.
Sodium Lanterns (60 watts), complete with equipment in lanterns.
Sodium Lanterns (60 watts), complete with equipment for base of column.
Solar Dial Time Switches.
3/029 Twin and Earth Cable.

Specification and form of tender may be obtained from the Borough Surveyor, Hanover Street, Batley, and tenders, in a plain sealed envelope (not bearing any name or mark indicating the sender), endorsed "Tender for Street Lighting Equipment," must be delivered to the undersigned not later than 1st April, 1958.

The Corporation does not bind itself to accept the lowest or any tender.

L. O. BOTTOMLEY,
Town Clerk. 2827

### HAMPSHIRE COUNTY COUNCIL

**Farnborough Technical College: Phase II**

THE County Council invites applications from suppliers for inclusion in a SELECTED LIST OF TENDERERS for the supply of Laboratory Equipment for Physics for work of post-Ordinary National Certificate standard in Applied Physics and also for Electronics and Servo-Mechanisms equipment of Higher National Certificate and post-Higher National Certificate standard.

Inclusion in this list can only be considered for firms experienced in the supply of these articles to technical colleges.

Applications addressed to the undersigned should be made before 28th March, 1958.

The County Council does not bind itself to accept the lowest or any tender.

G. A. WHEATLEY,
The Castle, Clerk of the County Council.
Winchester. 2762

### ROTHWELL (YORKS) URBAN DISTRICT COUNCIL

**Supply and Erection of Group "A" and Group "B" Lighting Equipment**

TENDERS are invited for the supply, delivery and erection of 173 140-watt and 197 45-watt Sodium Discharge Street Lighting Units with reinforced or prestressed concrete columns.

Specifications, bills of quantities and forms of tender may be obtained upon application to the Engineer and Surveyor, on deposit of two guineas, which will be returned on receipt of a bona fide tender not subsequently withdrawn.

Tenders are to be enclosed in a plain envelope endorsed "Street Lightings Groups A & B," and returned not later than 9 a.m. on 10th April, 1958, to the undersigned.

ALLEN T. S. ROBERTSON,
Clerk of the Council.
Civic Buildings,
Rothwell, Leeds. 2828

CLASSIFIED ADVERTISEMENTS ARE PREPAID

### DAMODAR VALLEY CORPORATION

THE Office of the Damodar Valley Corporation, Anderson House, Alipore, Calcutta, 27, India, invites tenders for the following :—

D.V.C. Tender Inquiry No. PE-Spec. 43: Motor Control Centres for D.V.C. Durgapur Thermal Power Station.

Specifications relative to the above can be purchased direct from the Damodar Valley Corporation of the above address at Three Pounds Fifteen Shillings each plus air parcel charges of One Pound Seventeen Shillings and Sixpence. Tenders are to be returned direct to D.V.C., Calcutta, to reach there on 23rd April, 1958.

Specimen copy of the above specification is on view at India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, under reference S.5290/57/AVH/ENG.2. 2829

## SITUATIONS VACANT

### SOUTH EASTERN ELECTRICITY BOARD

SECRETARY, Croydon and West Kent Sub-Area. Applicants should have a wide experience in administration and preferably hold an appropriate qualification. Salary for the appointment, which is superannuable, will be within the salary scale Class C, Grade 5 of the National Joint Managerial and Higher Executive Grades Committee, £1,900 to £2,100 p.a. plus London allowance, according to qualifications and experience.

Applications, naming two referees, to T. A. D. Honnor, M.I.E.E., Manager, Croydon and W. Kent Sub-Area, SEEBOARD, Electric House, Wellesley Road, Croydon, by 2nd April, 1958.

DEMONSTRATOR, Lewes District. Salary £500 × £20 to £600 p.a., under N.J.C. Grade 1. Superannuable. Applicants should possess a recognised diploma or certificate in domestic science, also E.A.W. Certificate. The successful applicant will be required to conduct lectures and demonstrations, advise consumers, and generally assist in any of the District's showrooms.

Applications, on forms from District Manager, SEEBOARD, 80/81, High Street, Lewes, Sussex, by 2nd April, 1958.

ASSISTANT DISTRICT ENGINEER, West Kent District. Salary £790 × £15 to £835 plus London allowance, under N.J.B. Class F, Grade 9. Superannuable. Candidates should preferably have the Higher National Certificate or equivalent and practical experience in the operation, maintenance and construction of M.V. and 11-kV underground and overhead systems. The appointment will involve standby duty.

Applications on forms from H. C. Poore, West Kent District Manager, SEEBOARD, 270, High Street, Orpington, Kent, by 2nd April, 1958.

GENERAL ASSISTANT ENGINEER, Sevenoaks and Reigate District. Commencing salary £685 to £790 p.a. under N.J.B. Agreement, Class F, Grades 11 to 9, according to qualifications, experience and ability. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems, preferably up to 33 kV. The position entails standby duties. The successful applicant will operate from District Office, Oxted, and his duties will cover any point within the district's area.

Applications, naming two referees, to District Manager, SEEBOARD, Electric House, West Hill, Oxted, by 11th April, 1958.

G. WRAY,
Deputy Secretary.
2834

### MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

**Board Headquarters**

APPRENTICESHIP TRAINING OFFICER (Secretarial Department).

The successful applicant will be required to assist in the operation, amplification and, where necessary, the modification of the Board's apprenticeship training schemes. Duties will also include forward manpower planning insofar as it concerns these schemes and liaison with sub-area training officers on their operation. Applicants should preferably have served an engineering apprenticeship and obtained wide practical engineering experience within a large organisation. A sound knowledge of modern trends in the field of apprenticeship training is essential. Appropriate technical qualifications desirable. Salary within the range £1,145/£1,410 per annum (N.J.B. Schedule B, Grade 4) according to qualifications and experience. Apply by letter, within fourteen days, stating age, experience, present salary and position, to The Secretary (Ref. FWC), Midlands Electricity Board, Mucklow Hill, Halesowen, Nr. Birmingham.

**North Staffs Sub-Area**

THIRD ASSISTANT DISTRICT ENGINEER (Leek).

Applicants should have had experience in the operation and maintenance of distribution systems. Technical qualifications desirable. Salary per annum £740/£785 (N.J.B. Grade E.9). (The district classification may shortly be raised to F). Apply by letter within 14 days, stating age, experience, qualifications, present position and salary to the Sub-Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

**Central Gloucestershire Sub-Area**

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER (Dean Forest).

Applicants should have a sound commercial background with experience of electrical installations, and of sales promotion, including the organisation of sales campaigns, the buying, selling, and control of stock, and advice to consumers. Duties will include supervision of the work of service centres, demonstrators and outside sales representatives. Appropriate qualifications desirable. Salary £885/£930 per annum (N.J.B. Grade E.6). Apply by letter within 14 days, stating age, qualifications and experience, present position and salary, to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126, London Road, Gloucester.

A. STEPHENS,
Secretary.
2844

### SALES REPRESENTATIVE

for manufacturer required for W. and N. Lancs., N. Wales, living within 20 miles Liverpool. To promote sales of "Ashley" Guaranteed Electrical Installation Accessories. Would suit hardworking enthusiast having electrical experience and connections with electrical trade, etc., in area.

Salary, commission, expenses, pension scheme. Car provided.

Full letter describing qualifications, career, age, home telephone number, confidentially to Sales Director, Ashley Accessories Ltd., Ulverston, Lancs. All acknowledged. 2833

*Situations Vacant (continued)*

## WEST SUSSEX COUNTY COUNCIL

**Crawley College of Further Education**

**Department of Science and Electrical Engineering**

APPLICATIONS are invited for the following posts, to commence 1st September, 1958 :—

(a) ASSISTANT LECTURER (Grade B). To teach Electrical Engineering subjects to Ordinary National Certificate and Electrical Trades courses.

(b) ASSISTANT LECTURER (Grade B). To teach general Electrical subjects, but with a bias towards Light Current applications. Experience in teaching Radio Servicing would be an added qualification for this post.

(c) ASSISTANT LECTURER (Grade B). To teach Chemistry and Physics. In the first instance the standard required will be that of the G.C.E. "O" and "A" level in each subject, but it is intended that more advanced work shall be developed in the near future.

Housing available through the Crawley Development Corporation. The College will be moving to new premises in September, 1958, and in each case the successful candidate will be expected to assist in the development of the appropriate laboratories.

Further particulars and forms of application from the Director of Education, County Hall, Chichester, on receipt of stamped addressed foolscap envelope, and should be returned to the Principal, Crawley College of Further Education, Robinson Road, Crawley, Sussex. 2791

## A.E.R.E., HARWELL

Vacancy for a

SENIOR ENGINEER

for the

Estimating Programmes Group

THE ATOMIC ENERGY RESEARCH ESTABLISHMENT is building at Harwell a Proton Synchroton for the Rutherford Laboratories of the National Institute for Research in Nuclear Science. The project will cost several millions of pounds and will involve unusual buildings, complex mechanical plant and electrical and electronic equipment. The post is a senior one in the project team responsible for the design and construction of the machine.

The officer will undertake the drafting of programmes for design and construction and will be required to estimate capital costs involved, to review the progress of the project, and to ensure that designs being produced can be executed within agreed capital expenditures.

The essential requirement is that candidates should have previous experience in sanctioning expenditure and in the drafting of programmes and specifications for a capital project such as a power station, oil refinery, major chemical plant or steel works. Personal qualities of initiative and leadership are being sought, together with ability to negotiate at senior levels.

SALARY £2,100 - £2,600.

Send a POSTCARD to Group Recruitment Officer (1104Y/48), A.E.R.E., Harwell, Didcot, Berks., for application form and details.

2766

## SOUTHERN ELECTRICITY BOARD

**Assistant Engineer (Maintenance and Operation)**

Heston District of No. 1 (Southall) Sub-Area. Salary N.J.B. Class F, Grade 9, commencing at £830 per annum, rising to a maximum of £885 per annum (inclusive of London allowance). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of switchgear, transformers, auxiliary gear and underground cables up to and including 11 kV. The possession of suitable technical qualifications will be an advantage and the appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, in envelopes suitably endorsed, not later than 31st March, 1958.

**Assistant Engineer (Planning)**

Salisbury District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class E, Grade 10 (£685 × £15 to £730 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in electricity supply distribution, and the possession of suitable technical qualifications would be an advantage. The post will involve standby duties.

**General Assistant Engineer**

Lyndhurst District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class F, Grade 11 (£685 × £15 to £730 per annum). N.J.B. conditions of service.

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems. The possession of suitable technical qualifications would be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

Applications for these two posts on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him in envelopes suitably endorsed not later than 31st March, 1958.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 2832

## CENTRAL ELECTRICITY GENERATING BOARD

**London Division**

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. an advantage.

METHOD STUDY ENGINEER,
WORKS OFFICE,
ACTON LANE POWER STATION
(Vacancy No. 58/184).

Candidates should be of pleasant personality and possess considerable tact and analytical ability. Duties will involve detailed examination and analysis of management, administrative and manual tasks and problems. Evidence of ability to prepare clear and concise reports required. Experience, although advantageous, not essential as training will be given. Salary Class J, Grade 10 = £935 p.a.

PLANNING ENGINEER,
WORKS OFFICE,
ACTON LANE POWER STATION
(Vacancy No. 58/185).

Candidates should be able to plan, in considerable detail, outage programmes for power station plant generally. Initiative, tact and drive, together with sound technical education and training, are essential. Salary Class J, Grade 10 = £935 p.a.

STATION SHIFT CONTROL ENGINEER,
BARKING "C" POWER STATION
(Vacancy No. 58/186).

Sound technical training with experience in control and operation of modern generating plant and E.H.T. switchgear. Salary Class J, Grade 10 = £935 plus £88 10s. shift p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 31st March, 1958. 2789

## EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

**Fens Sub-Area**

SUB-AREA HEADQUARTERS, CAMBRIDGE. FOURTH ASSISTANT ENGINEER, PLANNING AND DEVELOPMENT (28/58.R.).

The work involves the planning of schemes at L.V. and 11 kV over the whole Sub-Area and participating in the planning of extensions to the 33 kV system. A good background of technical training in distribution, with qualifications of Grad.I.E.E. standard, is desirable. The position offers an excellent opportunity for obtaining experience over a wide field of planning work.

Salary N.J.B. J.13 (£740-£785).

Apply by letter within 14 days, to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge. Previous applicants need not re-apply.

**Northmet Sub-Area**

BARNET DISTRICT. THIRD ASSISTANT ENGINEER (Ref. 771) (29/58.R.).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class F, Grade 9 (£790-£835), plus London allowance.

Apply by letter, to L. F. G. Baker, Manager, Eastern Electricity Board, 7c, High Street, Barnet, by 31st March, 1958.

HENDON DISTRICT. GENERAL ASSISTANT ENGINEER (Ref. 777) (30/58.R.).

Candidates should have had a good general and technical education and possess the Higher National Certificate or an equivalent qualification.

Salary N.J.B. Class G, Grade 13 (£635-£680), plus London allowance.

Apply by letter, to R. F. Winder, M.I.E.E., Manager, Eastern Electricity Board, 137/9, Brent Street, Hendon, N.W.4, by 31st March, 1958. 2845

## ESTIMATING ENGINEER

**Electrical Control Gear**

'ENGLISH ELECTRIC'

STAFFORD.

THE company wishes to appoint an ESTIMATING ENGINEER with experience in the costing of heavy electrical plant control systems. The position carries a status which should interest engineers with 3-5 years' experience in this work.

There is also an opening for a JUNIOR ELECTRICAL ENGINEER in this field. This latter vacancy should be of interest to younger men who are pursuing their H.N.C. (Electrical) and possibly already have allied experience associated with either transmission or light industrial installations.

Please write giving full details to Central Personnel Services, 336/7, Strand, London, W.C.2, quoting Ref. ER1294E.

2796

## SENIOR DESIGNER

required, with experience in H.V. switchgear and/or overhead line fittings.

Excellent salary and prospects offered to the right man.

Write in first instance, giving full particulars, to :—

**POWER CONNECTORS LTD.**
**2, Caxton Street, London, S.W.1**

2661

## CENTRAL ELECTRICITY GENERATING BOARD

### East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

THIRD ASSISTANT ENGINEER (Electrical), GENERATION CONSTRUCTION, DIVISIONAL HEADQUARTERS (Vacancy No. 43/58/ER).

Applicants should have had a fundamental training in electrical engineering, including workshops, and should preferably have had experience in the manufacture, erection and maintenance and operation of electrical plant as installed in modern power stations. Preference will be given to candidates who possess a degree or are Graduate Members of the Institution of Electrical Engineers.

Salary will be within Class AX/EX, Grade 6 (£895-£1,140 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 26th March, 1958.

STATION CHEMIST, AVON POWER STATION (Warwick) (Vacancy No. 49/58/ER).

Previous experience in a power station laboratory is essential, and candidates should hold the Higher National Certificate in Chemistry.

Candidates must be familiar with the methods of sampling and analysis of coal, water and oil, and with the interpretation of the analytical results.

Salary will be in accordance with Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 2nd April, 1958.

These appointments will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

L. F. JEFFREY,
Divisional Controller.

13th March, 1958. 2804

## ELECTRICAL ENGINEERS

BRITISH GECO ENGINEERING CO. require JUNIOR ELECTRICAL ENGINEERS for their Induction Heating Dept., situated 25 miles south of London. Applicants should be of H.N.C. standard, aged about 25, have served recognised apprenticeship and be experienced in diagrams and contract work or test and development work. Knowledge of heavy electrical engineering more important than induction heating knowledge.

These positions are permanent and progressive and qualify for entry into the company's pension scheme.

Apply giving full details of training, experience and salaries received to British Geco Engineering Co., Station Road, Edenbridge, Kent.

2770

## FULLER ELECTRIC LIMITED

### Test Engineer

THIS is a permanent and pensionable staff position offering good prospects and opportunities to a young man, aged 23-28. Work is in connection with large E.H.V. transformers and associated gear. Some experience on this type of work is desired, but training will be given if previous experience and qualifications are suitable.

Technical education: Higher National Diploma (Elec.) or equivalent.

Apply, stating age and giving full details of qualifications and experience, to Personnel Officer, Fuller Electric Ltd., Fulbourne Road, London, E.17. 2793

## CENTRAL ELECTRICITY GENERATING BOARD

### South Western Division

APPLICATIONS are invited for the following superannuable appointments:—

GENERAL ASSISTANT ENGINEERS, PORTISHEAD B POWER STATION.

Preference will be given to candidates who hold or are at present studying for a Higher National Certificate or similar qualification.

Salary N.J.B. Class K, Grade 15, £685 × £15 to £730.

SECOND ASSISTANT ENGINEER (Construction), TRANSMISSION DEPARTMENT, DIVISIONAL HEADQUARTERS.

The successful candidate will be responsible for the supervision of contracts in connection with a group of new grid substations and extensions to existing substations. The duties include co-ordination of technical and engineering features, the programming of contracts and the supervision of construction work on site.

Salary N.J.B. AX/DX Grade 4, £1,145-£1,270/£1,375.

FOURTH ASSISTANT ENGINEER (Construction), TRANSMISSION DEPARTMENT, DIVISIONAL HEADQUARTERS.

The successful candidate will assist in the duties outlined above and will require a sound education and training as an electrical engineer with knowledge of switchgear (including control and protection equipment), transformers and cables.

Salary N.J.B. AX/DX, Grade 8, £710-£835/£910.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 31st March, 1958. 2841

## MICHELIN TYRE CO. LTD.

### Stoke-on-Trent

have progressive openings for

DESIGNER / DRAUGHTSMEN

with H.N.C. (Electrical), or O.N.C. and now studying for H.N.C., for interesting work on motor applications, lighting schemes and general factory electrical services.

Good commencing salaries related to qualifications and experience are offered plus a contributory pension scheme, free life assurance and excellent welfare facilities.

ASSISTANCE WITH HOUSING WILL BE GIVEN IF REQUIRED

Please write in confidence to:—

**Mr. A. C. McCombie**

**c/o above**

quoting reference B3/ER

2594

## INSPECTING ENGINEERS

VACANCIES exist for experienced INSPECTING ENGINEERS for work which entails visiting contractors for purposes of inspection and test of

(a) Mechanical and fabricated plant.
(b) Electro-mechanical equipment and instruments.

Minimum academic qualifications H.N.C.

Apply to :

**The Secretary (Ref. IE/ER)**
**ATOMIC POWER CONSTRUCTIONS LTD.**
**28, Theobalds Road, London, W.C.1**

2811

## ROYAL NAVAL SCIENTIFIC SERVICE

PHYSICISTS, ELECTRONIC ENGINEERS and MATHEMATICIANS required for 25 Senior Scientific and Scientific Officer posts at establishments in London area, Baldock, Harwell, Haslemere, Poole, Greenock and Rosyth. Also MECHANICAL ENGINEER for work on heat transfer problems at Harwell. MECHANICAL ENGINEER for work on fuel and lubricating oil problems in London area. MECHANICAL ENGINEER for work on gas turbine problems in London area. CHEMICAL ENGINEERS for London area and Poole. METALLURGISTS for Rosyth and Poole. CHEMISTS (physical and inorganic) for Poole and Baldock.

Candidates must normally be natural-born British subjects of natural-born British parents, with at least First or Second Class Honours degrees or equivalent high professional attainments. S.S.O.s must have had at least three years' postgraduate experience and be 26 years of age.

Salaries (men): S.S.O. £1,190-£1,410; S.O. £635-£1,110 (London); somewhat lower in Provinces. Appointments are unestablished (with F.S.S.U. benefits), but opportunities may occur for those under 32 to compete for established posts.

Forms from M.L.N.S., Technical & Scientific Register (K), 26, King Street, London, S.W.1, quoting A.98/8A. 2807

## ELECTRICITY CORPORATION OF NIGERIA

### Vacancy for a Power Station Chemist

APPLICATIONS are invited from suitably qualified persons for appointment to the above post.

Applicants, who should not be more than 45 years, should have a minimum educational qualification of Higher National Certificate, and also have had practical experience of fuel, oil and water testing as applied to modern power stations. A knowledge of water treatment for medium and high pressure steam plant is also essential.

Salary in scale £1,125-£1,341 plus inducement addition of £270-£300, according to qualifications and experience.

The above appointment will be on contract terms of one or two tours of not less than 18 months' continuous service. The post carries an additional contract allowance of 10% of the basic salary and a lump sum gratuity of 25% of the total emoluments (excluding contract allowance) at the conclusion of the contract. An outfit allowance of £60 is payable on appointment.

First class passages are provided with special passage arrangements and allowances for the officer's wife and up to two children.

Quarters with hard furnishings will be provided at a low rental.

Further particulars and application forms may be obtained on request from the Electricity Corporation of Nigeria, 9, Northumberland Avenue, London, W.C.2.

2785

## ELECTRICAL ENGINEER

A LARGE industrial group engaged on the design and construction of Chemical Plants and Oil Refineries wish to engage an ELECTRICAL ENGINEER for their Electrical Division situated in the West End, London.

This position would be of particular interest to a young Graduate Member I.E.E. with some experience in planning power and lighting installations in industrial premises. Experience in design of H.V. and L.V. distribution systems would be an advantage. Excellent prospects. Salary up to £1,200 p.a.; 5-day week. Contributory pension scheme.

Please reply giving fullest details to—Box 2764.

*Situations Vacant (continued)*

## CENTRAL ELECTRICITY GENERATING BOARD

### Southern Division

SOUTHERN DIVISION, Central Electricity Generating Board, have vacancies for :—
(a) SUBSTATION ATTENDANTS.
(b) ASSISTANT SUBSTATION ATTENDANTS.
at Fleet Substation, Mill Lane, Crondall, Hants. Applicants for (a) should have had experience in the control of electrical plant, and for (b) general electrical experience.
(c) FITTER.
(d) FITTER'S MATE.
at Aldershot Section, Lower Weybourne Lane, Farnham. Applicants for (c) should have served an indentured apprenticeship.
N.J.I.C. conditions of service.
Rates of pay:—
(a) 4s. 4d. per hour plus 3d. when on shift.
(b) 4s. 0½d. per hour plus 3d. when on shift.
(c) 4s. 7½d. per hour.
(d) 4s. per hour.
Applications giving full details of experience and posts held should be forwarded to the Section Engineer, Grid Substation, Lower Weybourne Lane, Farnham, Surrey, by 1st April, 1958. 2843

## YOUNG MAN

required for

CONTRACTS DEPARTMENT

of an old-established engineering firm handling Railway Equipment, including lighting and heating.

The duties will be compilation of estimates and preparation of tenders for submission to railways and carriage builders throughout the world.

Applicants should preferably have had practical experience in electrical work and should have reached at least Ordinary National Certificate standard.

Please write—

Box 2VN1702, A.K. Advg.
212a, Shaftesbury Avenue
London, W.C.2.

2824

## CITY AND COUNTY OF KINGSTON UPON HULL

### City Engineer's Department

### Street Lighting Assistant

APPLICATIONS are invited for the appointment of STREET LIGHTING ASSISTANT. Salary within the Special Grade £750/£1,030.

Preference will be given to candidates who have had electrical training and experience in the design and erection and control of all types of street lighting installations and the control and supervision of maintenance work by direct labour.

Housing accommodation will be provided for the successful married candidate if not already resident within the city.

Applications, on forms which can be obtained from the City Engineer, Guildhall, Kingston upon Hull, accompanied by copies of testimonials, are to be returned not later than a fortnight after the appearance of this advertisement.

WM. MORRIS, O.B.E.,
Guildhall, City Engineer.
Kingston upon Hull. 2806

## CENTRAL ELECTRICITY GENERATING BOARD

### North Eastern Division

### Fourth Assistant Engineer, Technical Dept.

APPLICATIONS are invited for the above appointment in the Protective Gear and Electrical Plant Testing Section of the Technical Department with headquarters at Newcastle upon Tyne.

The duties consist of the testing, commissioning and maintenance of electrical protective gear and the testing and commissioning of alternators, transformers, switchgear, lines, etc., designed for working at voltages up to 275 kV and their ancillaries.

Applicants must have had experience with protective gear and should possess qualifications approaching Grad. I.E.E. standard.

The salary for this appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule B, Grade 7 (£810-£1,010 per annum), and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Generating Board, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to arrive not later than 8th April, 1958. 2803

## MACHINE CONTROL ENGINEER

'ENGLISH ELECTRIC'

STAFFORD.

THE company wishes to appoint an Engineer to its expanding Machine Control Engineering Department.

The work involves the application of electrical machines to industrial drives and test plant. This takes the form of control scheme design; the preparation of schematic diagrams and complete specifications; estimates and the writing of operating instructions for the whole project.

Applicants should be professional engineers who have completed an apprenticeship in heavy electrical engineering. Subsequent experience in a diagram office or an electrical design office would be an asset.

Please write giving full details to Department C.P.S., Marconi House, Strand, London, W.C.2, quoting Ref. ER1295E.

2795

## CENTRAL ELECTRICITY GENERATING BOARD

### Research Laboratories, Leatherhead, Surrey

APPLICATIONS are invited for the appointment of ASSISTANT ENGINEERS to work at the RESEARCH LABORATORIES AT LEATHERHEAD, SURREY, on a wide range of problems associated with conventional and nuclear power stations. Present investigations concern heat transfer in nuclear fuel elements and heat exchangers, electrostatic precipitators, cooling towers and boiler feed pumps.

Candidates for senior vacancies should have an Honours Degree with previous research experience; for other vacancies a Pass Degree or H.N.C. with appropriate experience would be acceptable, but importance is attached to ability to apply fundamental knowledge to a wide range of problems.

Salary according to ability and experience: Second Assistant, £1,160-£1,510 per annum; Third Assistant, £1,055-£1,265 per annum; Fourth Assistant, £820-£995 per annum; General Assistant, £550-£725 per annum.

Application forms from I. G. Ellis, Personnel Officer, Central Electricity Generating Board, 24/30, Holborn, London, E.C.1, to be returned by 2nd April, 1958. Quote reference ER/83. 2805

## SOUTH OF SCOTLAND ELECTRICITY BOARD

### Stirling Area

AREA TRANSPORT SUPERINTENDENT required for this Area. Conditions of service will be in accordance with the National Joint Council (Administrative and Clerical Grades) Agreement for the Electricity Supply Industry. The post is superannuable.

Applicants should have served a regular apprenticeship in motor vehicle engineering and be conversant with modern methods of vehicle maintenance and the control and supervision of the use of a transport fleet comprising private cars, light vans and medium trucks.

The salary will be in accordance with said Agreement, Grade 4, £765/£840 per annum.

The successful candidate will be required to operate from Falkirk and to reside within easy reach of that town.

Application forms, which may be obtained from the undersigned, are to be returned not later than 28th March, 1958.

JAMES G. CURTIS,
Woodlands, Area Manager.
St. Ninians Road, Stirling.
7th March, 1958. 2788

## JOSEPH LUCAS (ELECTRICAL) LIMITED

### Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

## THE GENERAL ELECTRIC COMPANY LIMITED

### Witton, Birmingham, 6

YOUNG QUALIFIED ELECTRICAL ENGINEERS required for work in connection with the preparation of tenders for plant and associated control gear.

The work is interesting and covers a wide field involving steel works, mining and industrial plant installation, and provides a good opportunity for young men of initiative to widen their experience and attain senior status.

Applicants should possess H.N.C. (Electrical) or equivalent, together with some knowledge of estimating and tendering.

Interviews in the strictest confidence will be arranged at any time to suit the convenience of applicants.

Adequate assistance is available to cater for change of district. Generous salary levels are offered. Salary at commencement depending upon qualifications and experience.

Please apply with full particulars to—

THE STAFF MANAGER.

2810

## SURREY COUNTY COUNCIL

APPLICATIONS invited for appointment of ASSISTANT ELECTRICAL ENGINEER, Special Grade, £750-£1,030 p.a. plus £30 p.a. London allowance. Must be A.M.I.E.E. and experienced in electrical services in buildings.

Full details, present salary and 3 copy testimonials to County Architect, County Hall, Kingston, as soon as possible. 2808

## LONDON ELECTRICITY BOARD

**Commercial Assistant (Development)**

APPLICATIONS are invited for the above position in the North Western District at Hampstead, N.W.3.

Applicants are required to have had sound experience in all aspects of commercial development, sales, consumers' service and installations, including water heating. The successful candidate will be required to undertake the more responsible work of this nature and may be required to organise local sales and development campaigns, supervise Senior Development Assistants and other staff, assist in the training of Development Staff, and act during temporary absences of assistants to the District Commercial Engineer.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 3, i.e., £715 to £790 per annum, inclusive of London area allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 31st March, 1958. Please quote ref. PER/2449/R. 2794

## COUNTY BOROUGH OF CROYDON EDUCATION COMMITTEE

**Croydon Technical College, Fairfield, Croydon**

Principal: H. Falkner, M.Sc.(Wales), B.Sc.(Lond.), A.Inst.P.

APPLICATIONS are invited for the post of LECTURER in the Electrical Engineering Department.

Candidates should be qualified to teach Electrical Engineering (Power) to Higher National Certificate standard. Some knowledge of servo-mechanisms and industrial electronics will be an advantage.

Salary in accordance with the Burnham Technical Scale plus London allowance.

Duties to commence on 1st May or as soon as possible after.

Further particulars and form of application may be obtained from the undersigned on receipt of a stamped addressed envelope, and completed forms should be returned to the Principal.

R. WEARING KING,
Chief Education Officer.

Education Office,
Katharine Street, Croydon. 2776

## DEPUTY SUPERINTENDENT WINDING DEPARTMENT

APPLICATIONS are invited for the post of DEPUTY SUPERINTENDENT of the Winding Department, dealing with A.C. and D.C. machines.

This is a senior works appointment with promotion prospects for a man having managerial experience and knowledge of modern H.T. winding methods. Good salary, bonus and pension fund, with possible assistance in housing.

Applications, which will be treated in strict confidence, should be sent to:—

**Personnel Manager**
**LAURENCE, SCOTT & ELECTROMOTORS LTD.**
**Gothic Works, Norwich**

2711

## REMINGTON RAND LTD.

**(Shaver Division)**
**Thornliebank, Glasgow**

ELECTRICAL ENGINEER required with some industrial experience of light electro-mechanical appliances for a vacancy in product engineering department.

Applicants with university degree in electrical/mechanical engineering will have preference, but others will not be precluded from consideration.

Write in first instance, giving training and experience, in chronological order to Personnel Department. 2809

## CENTRAL ELECTRICITY GENERATING BOARD

**Eastern Division**

APPLICATIONS are invited for the following post:—

STATION SHIFT CONTROL ENGINEER, GREAT YARMOUTH GENERATING STATION.

Salary Class D, Grade 10, £635 × £15 to £680 per annum, plus 10% shift allowance.

Applicants should have reached the standard of Ordinary National Certificate in Electrical Engineering, or its equivalent, have experience in the operation of a switchboard at a generating station, and be fully conversant with high-voltage switching operations and protective systems.

Apply by 29th March, 1958, quoting reference No. 2/9063, giving age, details of experience and qualifications to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts.

W. N. C. CLINCH,
Controller. 2790

## TENDERING AND CONTRACT ENGINEERS

are required by the General Engineering Division of Brush Electrical Engineering Company Limited, Loughborough, one vacancy being available in each of the following sections:—

STEAM POWER STATIONS.
DIESEL POWER STATIONS.
INDUSTRIAL ELECTRICAL APPLICATIONS.

These are office appointments, which offer considerable scope for the exercise of initiative, and in which allied experience abroad would be an advantage. Applications will be welcomed from engineers who lack the necessary commercial experience but feel that given the opportunity they would enjoy this type of work. There are no age limits and a non-contributory staff pension scheme is in operation.

Applications should be addressed to the Chief Personnel Officer, Brush Electrical Engineering Co. Ltd., Loughborough, Leics. Interviews can take place in a number of large towns by arrangement. 2792

## THE UNIVERSITY OF MANCHESTER

APPLICATIONS are invited from suitably qualified graduates for posts in the DEPARTMENT OF ELECTRICAL ENGINEERING as LECTURER or ASSISTANT LECTURER. Candidates should have some experience in any of the branches of electrical engineering.

The salary scales are as follows: Lecturer, £900 to £1,650 per annum; Assistant Lecturer, £700 to £850 per annum; initial salary and status according to qualifications and experience. Membership of F.S.S.U. and children's allowance scheme.

Applications should be sent not later than 31st March, 1958, to the Registrar, The University, Manchester, 13, from whom further particulars and forms of application may be obtained.

Overseas applicants should send letters of application (no forms) as soon as possible, giving details of qualifications and experience, and should submit the names of at least 3 persons to whom reference may be made. 366

## YORKSHIRE ELECTRICITY BOARD

**No. 5 (Wakefield) Sub-Area**

THIRD ASSISTANT ENGINEER (Development). The successful applicant will be required to visit and advise architects and industrialists throughout the Sub-Area in the furtherance of electrical load development.

Preference will be given to engineers with appropriate technical qualifications who have had experience in the design of heating. Experience of industrial process heating would be an advantage.

Salary N.J.B. Class I., Grade 10, £995/£20/£1,055 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 12, Denby Dale Road, Wakefield, not later than 4th April, 1958. 2835

## COUNTY COUNCIL OF NORTHUMBERLAND

**County Architect's Department**

ASSISTANT ELECTRICAL ENGINEER required on the permanent staff of the County Architect's Department. Salary scale within the range £575-£845 per annum, A.P.T. Grades I or II, in accordance with qualifications and experience.

Candidates must be capable of preparing installation drawings for schools or other buildings usually carried out by a County Council; supervision of work will be given should any applicants who wish to apply feel they are not fully experienced.

Applications giving full details of age, education, qualifications and previous experience, together with the names of two referees to whom reference can be made, should be forwarded to the County Architect, County Hall, Newcastle upon Tyne, 1, within fourteen days of the publication of this advertisement.

The appointment will be subject to the provision of the Local Government Superannuation Acts and the successful candidate will be required to pass a medical examination. 2836

## ELECTRICAL ENGINEER

**Public Works Department, Uganda**

TO work under the Chief Electrical Engineer and to assist him in the investigation of electrical accidents, drafting electricity legislation and its general administration, and the testing of electrical installations and plant. Also to design electrical schemes for Government institutions and supervise their execution and assist in the arbitration of disputes between the Uganda Electricity Board and consumers.

Contract appointment for 30-36 months in the salary range £1,194 to £1,863 plus a gratuity of 13½% of salary on satisfactory completion of contract. Quarters if available at low rental. Free passages. Generous leave.

Candidates, between 28 and 44 years of age, must be A.M.I.E.E. or have a university degree and five years' experience.

For application form and further particulars write to Director of Recruitment, Colonial Office, London, S.W.1, stating age, professional qualifications and experience. Quote BCD.112/9/021. 2838

## BIRKENHEAD EDUCATION COMMITTEE

**Birkenhead Technical College**

Principal: C. V. Vinten Fenton, M.Sc., A.M.I.Mech.E., A.M.I.E.E.

APPLICATIONS are invited for the following appointment to the full-time teaching staff:—

ASSISTANT GRADE "B," Electrical Engineering Department for O.N.C. subjects and Electrical Installation Work.

Salary in accordance with the Burnham Technical Report, 1956.

Further particulars and forms of application may be obtained from the undersigned, to whom completed applications should be returned by 2nd April, 1958.

H. GLYN WILKINSON,
Director of Education.

63, Hamilton Square,
Birkenhead. 2831

## SOUTHERN RHODESIA GOVERNMENT

**Department of Labour:**
**Vacancy: Inspector of Machinery**

APPLICANTS must be qualified engineers in possession of an approved certificate in mechanical or electrical engineering or the Ministry of Transport First Class Marine Engineers Certificate, and must have had good all-round experience.

The duties will include the inspection of all classes of boilers, elevators and general machinery, and previous experience in inspection work of this kind, particularly the inspection and testing of boilers, will be a recommendation.

Salary scale £1,220 × £50 to £1,620.

Application forms and further details from Secretary (R), Rhodesia House, 429, Strand, London, W.C.2. Closing date 10th April, 1958. 2787

*Situations Vacant (continued)*

### AUSTRALIA: UNIVERSITY OF ADELAIDE

APPLICATIONS are invited for appointment as LECTURER IN ELECTRICAL ENGINEERING. Preference will be given to a candidate strong in Mathematics and Physics, and with some experience in electronics design and laboratory work.

Salary scale £A1,420 - £90 - £2,050; with superannuation on the F.S.S.U. basis.

Copies of the general conditions of appointment of lecturers in the university may be had on application to the Secretary, Association of Universities of the British Commonwealth, 36, Gordon Square, London, W.C.1, or to the Registrar. Any further information desired will be supplied on request.

Applications, in duplicate and giving the information listed in the general conditions of appointment, should reach the Registrar, The University of Adelaide, Adelaide, South Australia, not later than 30th April, 1958. 2763

### CENTRAL ELECTRICITY GENERATING BOARD

**South Wales Division**

Vacancy No. 31/ER/58

APPLICATIONS invited for superannuable N.J.B. appointment of OPERATION AND EFFICIENCY ENGINEER at CARMARTHEN BAY POWER STATION, Nr. Burry Port.

Salary K.5, £1,325-£1,415 per annum.

Engineering degree and/or Corporate Membership of the Institutions of Mechanical or Electrical Engineers desirable. Responsible to superintendent for efficient operation, plant tests and special investigations.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 31st March, 1958. 2858

Applications are invited by

### FREDERICK S. SNOW & PARTNERS

for

ASSISTANT ELECTRICAL ENGINEERS, intermediate grade, for the design specification and detailing of various electrification projects. The scope of work includes power distribution, electrical installations comprising heating, lighting and power in buildings of industrial, commercial and technical usage. Applicants should preferably be to H.N.C. standard of technical education, with an apprenticeship or equivalent training, and applicable experience. Candidates should send in confidence, full particulars of education, training and experience to:—

Frederick S. Snow & Partners,
Box No. 116,
Monro Building,
Wellington Street, London, W.C.2.
2846

### ELECTRICAL DESIGNER-DRAUGHTSMAN

required by

W. H. ALLEN SONS & CO. LTD.
BEDFORD

for the development and design of A.C. and D.C. motor control gear.

This is a permanent appointment on interesting work with good prospects.

Generous pension scheme. Assistance towards removal expenses.

Apply in writing, giving full details of experience, to the Personnel Manager.
2712

### INSTRUMENT DESIGN DRAUGHTSMAN

A NEW factory is being established in Bothwell which has direct access to Glasgow by bus (9 miles). This factory is concerned with the design and manufacture of precision electro-mechanical equipment. In forming the nucleus of a design team a vacancy occurs for a DRAUGHTSMAN with instrument experience. First-class rates paid. Normal staff conditions apply.

Please apply, giving details of age and experience, to ref. JM/73, The Belmos Company Limited, Bellshill. 2777

### AIR MINISTRY

EXAMINERS IN AERONAUTICAL INSPECTION SERVICE. 25 pensionable posts for men and women at least 25 on 1st January, 1958. Vacancies mostly at Henlow, Beds. Others at Handforth, Ches., Carlisle, Stafford, and Gloucestershire and Wiltshire areas.

Qualifications: City and Guilds Inter. standard in telecommunications engineering. Apprenticeship or substantial experience with manufacturers of airborne or ground radar equipment or with R.A.F. (Aeronautical Inspection Service).

Starting salary (men) £625 up to £705. Maximum £820. Promotion prospects.

Write Civil Service Commission, 30, Old Burlington Street, London, W.1, for application form, quoting No. S4826/58. Closing date 30th April, 1958. 2839

### MAKE YOUR CAREER WITH STEWARTS AND LLOYDS LIMITED

who are extending their Manipulated Pipework Department and require

SENIOR MECHANICAL ENGINEERING DRAUGHTSMEN

for pipework systems for:
Nuclear and Super-pressure Power Stations,
Conventional Steam Raising Plants,
all types of industry.

Duties include visits to site and discussions with customers. Training will be given where necessary.

Holiday arrangements honoured. Good salaries, 5-day week, pension fund and canteen.

Apply Secretary, Stewarts and Lloyds Ltd., Broad Street Chambers, Birmingham, stating age, experience, etc. 118

### CENTRAL ELECTRICITY GENERATING BOARD

**Midlands Division**

ASSISTANT SHIFT CHARGE ENGINEER is required at Ocker Hill Power Station. N.J.B. service conditions, superannuable appointment, salary within schedule A, Grade G9, £835 to £880 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the control and operation of steam generating plant and main switchgear are required. Appropriate qualifications an advantage.

Apply quoting vacancy number 764MD on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 3rd April, 1958. 2842

### ASSISTANT ENGINEER (ELECTRICAL)

APPLICANTS must be Graduate Members of the Institution of Electrical Engineers, and have passed the Institution examination (lately the Associated Membership Examination) or hold exempting qualifications. Commencing salary on a scale rising to £1,065 per annum (inclusive of London weighting) according to age and experience.

The above post offers opportunities to cover the whole field of hospital engineering, but previous experience of this work is not necessary.

Applications, giving age, present salary, qualifications and experience (with dates), together with the names of two referees, should be sent to the Secretary, North East Metropolitan Regional Hospital Board, 11a, Portland Place, London, W.1, within 14 days. 2830

### NORTH WESTERN ELECTRICITY BOARD

SENIOR DRAUGHTSMAN (Electrical), SUB-AREA ENGINEERING DEPARTMENT, MANCHESTER. Applicants should have had a good technical training and drawing office experience in the electrical design, layout and detailing of indoor and outdoor substations up to and including 33,000 volts, together with the preparation of protective system schematic and wiring diagrams.

Salary scale £760 × £20 to £860 p.a., Schedule D, Grade 5. N.J.B. conditions.

Applications, naming three referees, to Sub-Area Secretary, No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, 2, P.O. Box 493, by 31st March, 1958. 2775

### THE UNIVERSITY OF SOUTHAMPTON

**Department of Electrical Engineering**

APPLICATIONS are invited for the post of LECTURER or ASSISTANT LECTURER in the Department of Electrical Engineering. Salary scales: Lecturer, £900 × £50 to £1,350 × £75 to £1,650; Assistant Lecturer, £700 × £50 to £850. Placing on scale according to qualifications and experience. F.S.S.U. and children's allowances. Duties to commence on 1st October, 1958.

Further particulars should be obtained from the Secretary and Registrar, to whom applications (7 copies), containing the names of three referees, should be sent not later than 31st March, 1958. 2786

### OLDHAM EDUCATION COMMITTEE

**Municipal Technical College**

APPLICATIONS are invited for the post of SENIOR LECTURER in Electrical Engineering to teach Higher National Certificate and I.E.E. Part III subjects. Candidates should have appropriate academic and professional qualifications, industrial and/or research experience, while teaching experience will be an advantage.

Salary in accordance with the Burnham (Further Education) Scale as follows: Senior Lecturers (Men), £1,350 × £50 to £1,550.

Further particulars and forms of application from the Director of Education, Education Offices, Union Street West, Oldham. 2837

### MECHANICAL ENGINEER

required for design of rotating electrical plant, including large hydro generators. Experience in this class of work desirable but not essential. Applicants must have practical and drawing office engineering experience. Minimum technical qualifications: Higher National Certificate in Mechanical Engineering. Compulsory pension and superannuation scheme. Assistance given with housing.

Apply, giving details of experience, etc., and salary required, to Manager, Rotating Plant Dept., Bruce Peebles & Co. Ltd., Edinburgh, 5. 2710

### ASSISTANT CHIEF ELECTRICAL ENGINEER

OPPORTUNITY in Glasgow for young man, aged 25/30, with experience in A.C. motor design, to assist Chief Electrical Engineer. This post covers a wide variety of work both on design and development of A.C. rotating machinery and also of factory installation. Applications should state technical qualifications, age, and previous experience.

Good pension scheme coupled with free life assurance. Canteen. Sport and social facilities. —Box 2840.

### TRANSFORMER ENGINEER

A WELL-known company will shortly have a vacancy for a CHIEF TRANSFORMER ENGINEER.

This is an important appointment, with considerable scope, and with excellent prospects for the right man, and carries a salary appropriate to the responsibility involved.

All applications will be in strict confidence. Existing staff has been informed.

Reply to—Box 2765.

### TRANSFORMERS (WATFORD) LIMITED

require

TRANSFORMER ENGINEER-DRAUGHTSMEN.

These appointments will command a really high salary for fully experienced applicants able to work quickly, accurately and individually from basic principles.

Apply Managing Director, Transformers (Watford) Ltd., Sandown Road, Watford, Herts. 2597

### TRANSFORMER DESIGN ENGINEER

APPLICATIONS are invited to fill vacancies in the Distribution Group of the Transformer Design Dept. of Bruce Peebles & Co. Ltd, Edinburgh, 5. Salary commensurate with qualifications and experience. Superannuation and production bonus schemes; 5-day week.

Apply to Chief Transformer Designer. 2709

A SWITCHGEAR engineer with sound knowledge of motor control gear and having commercial and organising ability required to take charge of drawing office and engineering contracts. State qualifications and experience and salary required to—The Director, Electro Mechanical Mfg. Co. Ltd., Scarborough. 2677

A TECHNICAL sales representative for Yeovil and West Country. Generous salary/commission/expenses. Must own car. Pension scheme, 5½-day week. Only applicants with experience, initiative and dynamic personality will be considered. Full details to—Man. Dir., British Central Electrical Co. Ltd., 6, Rosebery Avenue, London, E.C.1. 2812

A WELL-KNOWN nuclear power company has a first-class opportunity available for a sales executive. Applications are invited from fully qualified engineers who have experience in the field of power generation and supply, together with a high degree of administrative ability. The successful candidate will be required to travel at home and overseas in the pursuit of business and will have some executive responsibility under the company's commercial manager. Applications will be handled in strict confidence and should give a summary of education, technical training and business experience to—Box 2847.

A.M.I.E.E. or engineer with equivalent university degree required for new position involving responsibility for technical sales development of existing and new products with considerable market interest and potential. Good initial salary, superannuation scheme, etc. Apply — Sales Manager, Pyrotenax Limited, Hedgeley Road, Hebburn, Co. Durham. 2778

AN electrical engineer with H.N.C., or studying for same, required to assist in start-up work on automatic temperature controls for heating and air conditioning plants. Interesting work with expanding organisation with its own training school. Opportunity for sales application and engineering work later. Write with brief details to—Honeywell-Brown Ltd. (REA), 1, Wadsworth Road, Perivale, Greenford, Middlesex. 2848

ARMATURE winders. Foreman required to take charge of repair shop. Sound knowledge A.C. and D.C. work. Uxbridge area.—Box 9291.

ASSISTANT electrical engineer required by steel tube manufacturers in Birmingham, to be responsible for all electrical maintenance and repairs, including a large number of overhead cranes and other lifting appliances, total load 7,000 kVA. Applicants must be between the ages of 24 and 30, have a university degree or equivalent, and have served a recognised apprenticeship or training for at least 3 years in electrical engineering. Contributory pension scheme. Apply, stating age, qualifications, experience and salary required to — Personnel Manager, Tubes Limited, Rock Lane, Aston, Birmingham, 6. 2678

ASSISTANT electrical engineer required for contract work involving power cable installations and overhead line construction on sites in U.K. Excellent opportunity for young man willing to travel. Applications giving age and training to—Employment Manager, Johnson & Phillips Limited, Victoria Way, London, S.E.7. 2797

CIRCUIT design draughtsmen required by company manufacturing industrial control equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 273

CONSULTING engineers require urgently junior electrical draughtsmen conversant with lighting and power designs for industrial building schemes. Good conditions, site visits, non-contributory pension scheme, bonus scheme, luncheon vouchers, etc. Write or phone—Messrs A. F. Myers & Partners, 147, Victoria Street, London, S.W.1 (Tat. 8241). 2849

CROMPTON PARKINSON Limited, Traction Division, Chelmsford, invite applications from engineers with B.Sc., H.N.C. or equivalent qualifications. The position involves varied, interesting and responsible work in the expanding diesel-electric traction section. Applicants must have served an engineering apprenticeship, but previous experience in traction work is not essential. Excellent prospects. Starting salary commensurate with qualifications. Apply Chief Personnel Officer, Crompton House, Aldwych, London, W.C.2. 2813

DEVELOPMENT engineers to undertake design of rotary and fused switches, contactors and motor control gear in London area. Sound experience in one or more of these fields essential. State qualifications and salary required. Present staff notified.—Box 2771.

DEWHURST & PARTNER Ltd. require technical estimator for preparing tenders in their estimating engineering department. Applicant must have good electrical engineering background and have basic knowledge of motor control equipment and its applications. The position is a senior one, and housing assistance will be given to successful applicant if necessary. Canteen facilities, pension scheme. Write giving age, experience, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middlesex. 274

DRAUGHTSMAN required by telephone manufacturers in London, S.W.8. Good electro-mechanical experience essential. Please write stating age, experience and salary required.—Box 2798.

DRAUGHTSMAN required, preferably with experience of medium voltage metalclad switchgear. Bonus scheme and non-contributory superannuation scheme in operation. Housing assistance available to successful applicant. The company is in pleasant country surroundings within six miles of the South Devon coast. Write stating experience, age, etc., to—Ottermill Switchgear Ltd., Ottery St. Mary, Devon. 2850

DRAUGHTSMEN required for 3 senior posts in the N.C.B.'s Production Dept. in London. Sound technical education and practical training are required with experience in the layout of turbine, boiler and other plant associated with power stations, and ability to work on own initiative from engineer's instructions. Technical qualifications to H.N.C. standard are desirable. Occasional visits to sites in the coalfields and to manufacturers' works will be necessary. Appointments (superannuable) according to qualifications and experience within inclusive range £843-£1,123. Excellent career prospects, 5-day week, staff restaurant, etc. Write stating age, education, qualifications and experience to National Coal Board, Staff Dept. (X1090), Hobart House, London, S.W.1, before 28th March, 1958. 2768

EAST African installation contractors require supervising engineer, preferably experience abroad, aged 28/35, for general work.—Box 2752

EDITORIAL assistant with sound engineering background required for journal having special angle on industrial plants. Responsible work at professional level. Technical competence needed rather than journalistic brilliance. Applications in confidence to—Box 2799.

ELECTRICAL engineer required for Glasgow office of engineering division of a large organisation. Minimum technical training Higher National Certificate, and experience in preparation of schemes for power and lighting installations, costing, supervision of erection, and setting to work. Write to—Chief Engineer, The Distillers Co. Ltd., 64, Waterloo Street, Glasgow, C.2, giving full details and stating age and salary expected. 2851

ELECTRICAL engineers: A large engineering group who have their H.Q. in Birmingham have a few vacancies for electrical engineers in a department that provides a consulting service for a group of factories. Applicants should have had good experience on industrial electrical equipment, and a degree or its equivalent in electrical engineering is a desirable qualification. The company operates a superannuation scheme. Brief particulars of education, training and experience should be included in application addressed to Personnel Manager. —Box 2715.

ELECTRICAL engineers. The Belmos Company Ltd. require additional technical staff to fill responsible positions in various departments of the organisation. The company manufactures a wide range of control gear for mining and industrial applications, including contactors, circuit-breakers and comprehensive motor control boards. The research, development and design departments have available to them good laboratory facilities, including a short-circuit test plant. The technical staff in these departments conduct interesting investigations under good conditions, and are encouraged to make full use of their initiative in the continued development of the company's products. Applications are invited from engineers of appropriate training and experience at various levels, and should be addressed to the Chief Engineer, The Belmos Company Ltd., Bellshill, Lanarkshire. 2664

ELECTRICAL engineers, junior and senior, required for consulting engineers' office in London. Salary £1000-£1900 depending upon age, qualifications and experience.—Box 160.

ELECTRICAL test engineer to take charge of test room for transformers up to 10 kVA. H.N.C. or equivalent essential. £850 per annum, London area, five-day week. Superannuation scheme and insurance. Apply in writing giving full details of age, experience, etc., to—Box 2815.

ELECTRICIAN required with experience in internal wiring of industrial machinery, also general electrical installation and maintenance. Some mechanical aptitude an advantage. For a man of initiative this post offers prospects of considerable development.—Box 2814.

ELECTRO-mechanical draughtsmen required for production drawing office of company engaged in the manufacture of control gear equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 275

ENGINEER (degree standard) to take charge of development work in connection with power capacitors, high-voltage transformers, and the use of a 1,500-kV surge generator. Some previous experience in works and laboratory desirable. Apply in writing in the first place to—Chief Engineer, Bryce Electric Construction Co. Ltd., Kelvin Works, Hackbridge, Wallington, Surrey. 2641

ENGINEER required for duties in contracts dept., engaged on the preparation of switchgear tenders and their subsequent engineering. Apply—The Power Equipment Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9. 2714

ESTIMATING and contracts engineer required for expanding switchgear company. Should have H.N.C. or equivalent. Apply giving age, salary required and experience to date to—Reference AWB, Switchgear & Equipment Ltd., Banbury, Oxon. 2755

EXPERIENCED male clerk required by export dept. of electric cable manufacturers in Central London. Should have sound knowledge of industry. Good salary. L/Vs. Pension scheme.—Box 2779.

HEATING and electrical engineers required by consulting engineers near Tottenham Court Road, London. Applicants must have experience in the design of services in buildings, preparation of specifications, and be capable of site supervision. Commencing salaries within the following ranges: Junior engineer, £500 to £650; Intermediate engineer, £700 to £850; Senior engineer, £900 to £1,100. Corporate membership of the appropriate institution for the senior positions is preferable but not essential.—Box 2780.

IMPERIAL CHEMICAL INDUSTRIES Limited, Plastics Division, has immediate vacancies for electrical draughtsmen in the Chief Engineer's Department at Welwyn Garden City. Candidates must have served a recognised apprenticeship, and should hold Ordinary National Certificate. Experience of factory and general industrial installation work would be useful. An attractive starting salary will be offered to the selected applicants beyond which there is plenty of scope for progressive remuneration. The appointments carry membership to the staff pension fund and a profit-sharing scheme is in operation. For married men, special mortgage facilities can be granted towards house purchase, and assistance is given towards removal expenses. Temporary lodging allowances are also available for married men. Apply giving full particulars to the Staff Manager, Imperial Chemical Industries Limited, Plastics Division, Black Fan Road, Welwyn Garden City, Herts. 2680

LONDON representative required for the sale of P.V.C. and polythene cables to B.S.I. specifications. Applicants must have sound connections amongst exporters, wholesalers, etc. Excellent opportunity for right man. Reply in strict confidence giving full details and salary required to — The Managing Director, Plastic Insulated Cables Limited, 2, Buckingham Avenue, Slough, Bucks. 2772

MANAGER required for Northern branch of electrical contractors. Practical engineer, experienced in estimating, supervision, administration, and ability to increase turnover. Applications stating age, experience and salary required to—Box 2781.

### Situations Vacant (continued)

LIGHTING. Manufacturers require sales representatives for the Midlands, where they are well known but desire to extend their activities. Range includes industrial and commercial fittings, suitable for tungsten, mercury and fluorescent lighting, together with trunking. Selected applicants will need to prove very definite personal connections with works engineers, consultants, architects, electricity boards and larger contractors. Areas available are Coventry, Leicester, Derby, Nottingham, Birmingham and the Black Country. All replies will be treated with the utmost confidence and should give full details of experience, connections, age, whether car owner, and remuneration required.—Box 2800.

MACHINE shop foreman required by a medium size but expanding company of electro-mechanical manufacturers situated in South-East London. Experience in controlling male and female labour on all general purpose machines is essential. The successful applicant will be required to work under the existing foreman and to succeed to that position when he retires in the near future. Write in confidence, giving details of age, experience, qualifications and approximate salary required to—Box 2801.

MIDLAND ELECTRIC MANUFACTURING Co. Ltd. invite applications for two sales representatives to concentrate on the development of their electric wiring accessories, one in the London and one in the Yorkshire area. Progressive position for man having sound connections and knowledge of accessories. Apply, in confidence, giving full particulars of experience and age to the Sales Director, Reddings Lane, Tyseley, Birmingham, 11. 2773

OLD-established manufacturers are expanding their sales organisation which extensively covers the electric supply industry and electrical and civil engineering, and require additional representatives to be based (1) London and South East, (2) Yorks. and North East, (3) South West and Southern territory. Previous experience in this sphere not essential but electrical background or interests desirable and successful applicants will receive training. Age around 30. Remuneration by salary with car and all expenses. Fullest details of education and career in strict confidence to—Box 2852.

OPPORTUNITY offered to young man, under thirty, with electrical background to join the sales staff of an established firm of electric motor manufacturers in London.—Box 2817.

PHILIPS ELECTRICAL Limited have a vacancy in the Midlands region for a man aged 25/30 as lamp applications engineer. The work demands a good electrical engineering training (N.N.C. preferred) and a good knowledge of lamps and lighting equipment and circuits. Ability to deal with customers in the field and discuss lighting problems is essential. The position is pensionable with good prospects. Salary according to experience and qualifications. Write fully, in confidence, to the Employment Officer, Century House, Shaftesbury Avenue, London, W.C.2, quoting ref. 181. 2818

PLANNING engineer required by the Atomic Weapons Research Establishment, Aldermaston, Berks., to be responsible, through the drawing office to the production stage, for engineering a wide variety of electronic and electro-mechanical instruments to meet scientists' requirements, and for the production of prototypes. A recognised engineering apprenticeship required, and Corporate Membership of the I.E.E. or exempting qualifications. A knowledge of at least one of the following desirable: (a) high-voltage techniques up to 100 kV; (b) printed circuits; (c) potting techniques; (d) milli-microsecond circuitry. Salary £815 (at age 25) to £1,110 (at age 34 or over) to £1,270 p.a. Contributory superannuation scheme. A house or assistance towards legal expenses on house purchase will be available for married officers living beyond daily travelling distance. Postcards for application forms to the Senior Recruitment Officer at above address. Please quote ref. 1768/48. 2767

PROGRESSIVE vacancy as counter assistant exists in wholesale electrical staff, William Dibben and Sons Ltd., 62, Commercial Road, Southampton. Applicant must have 3 years' experience, accustomed to work as part of team, able to carry share of responsibilities; superannuation is available. Write giving full particulars of present and past appointments, and salary expected. 9307

REPRESENTATIVE required by cable manufacturing company to cover Essex, Herts and East and North London. Good salary, commission and expenses for experienced man with good connections. Car provided. Pension scheme. Write stating age and experience to—Aerialite Limited, 20-22, Craven Road, London, W.2. 2819

REPRESENTATIVE, 25/28 years, required for specialist selling in fittings accessories and parts by a widely known West London lighting fittings manufacturer. Previous experience in the trade an advantage, although not essential, but applications are only invited from young men who are keen, enthusiastic, ambitious and have a capacity for work. Excellent prospects. Write stating age, experience (if any) and career to date to—Box 2756.

SALES engineer required by well-known company in the Yorks area for range of L.T. switch and fuse gear. The post is a very attractive one and the existing staff are all aware of the vacancy. A young man suitably trained and preferably with a connection covering industrial users, architects, large contractors and wholesalers can make this appointment an excellent career.—Box 2758.

SALES engineer required, capable of preparing estimates and tenders for L.V. switchgear and distribution equipment. Good opportunity for young man with ability and initiative. Write giving age, experience, qualifications and salary required to—The Secretary, W. Lucy & Co. Ltd., Eagle Ironworks, Oxford. 2699

SALES engineer to operate from London office of leading manufacturers of electric motors up to 1,000 h.p. Pension scheme, bonus and opportunities for promotion for young man with the right personality and technical qualifications. Apply giving particulars in confidence of age, training, experience and salary.—Box 2757.

SALES manager. Progressive company manufacturing range of domestic and industrial thermostats requires sales manager. Should have thorough knowledge of correct application of thermostats of all types and good connections in the heating and ventilating trade. Remuneration up to £1,200/£1,500 p.a. according to qualifications and experience.—Box 9305.

SALES order clerk (male, 20-25) for lighting firm, Victoria, London, S.W.1. Preferably experienced, dealing with electrical contractors and trade users. 5-day week. Pension fund. Write fully stating salary required.—Box 2717.

SENIOR and assistant draughtsmen, experienced, for lighting and power schemes for hospital, office and school buildings, also specifications. Annual bonus, five-day week and 3 weeks' holiday. Consulting engineers, Holborn (London) area.—Box 2613.

SENIOR draughtsman required for progressive company of electrical/mechanical engineers, with experience on L.T. switchgear and fuseboards. Apply Chief Draughtsman, Peppers of Woking Ltd., Stanhope Road, Camberley, Surrey. 2774

SENIOR electrical designer required for A.C. and D.C. machines in sizes ranging from fractional to about 100 h.p. Write in confidence, giving age, experience and salary required, to—Box 2853.

SENIOR engineer required by well-known London electrical contractors. Write giving full particulars.—Box 2682.

SERVICE engineers: Hilger & Watts Ltd., makers of a wide range of scientific instruments, invite applications from young men interested in a career as full-time service engineers. Applicants must have a knowledge of physics and maths. up to G.C.E. or O.N.C. standard or previous experience of fault finding and adjustment on complex electronic equipment. Training in the specialised aspects of the work, including optics, will be arranged. Applicants must also possess a current driving licence and be willing to spend a large part of their time away from home. The posts are permanent and pensionable and offer a progressive career in an expanding company of international repute. Letters giving full details of experience and qualifications, and stating age, should be addressed to the Personnel Officer, Hilger & Watts Ltd., 98, St. Pancras Way, Camden Road, London, N.W.1. 2820

SURVEYOR required for wood pole line contract in Inverness area. Good salary and subsistence to right man. Apply in writing to—B. French Limited, Pike Mills, Kidderminster. 2802

STEAM plant superintendent wanted for Canadian-owned 12,500-kW public utility in Georgetown, British Guiana. Age 30-40, family man preferred. H.N.C. or failing that O.N.C. desirable. Good experience with oil-fired boilers and steam turbines essential. Salary equivalent of £1,680 per annum. Free passages both ways; three months' leave at end of three-year period; interim local leave; house with electric cooker and refrigerator provided at nominal rental. Applications, in writing only, with brief qualifications to Messrs. Mackness & Shipley, Parliament Mansions, Abbey Orchard Street, London, S.W.1, who will provide full particulars before interview. 2700

TECHNICAL sales representative required for area comprising Lancashire, Cheshire and North Wales. Knowledge of electric space heating and good connections in electrical trade circles essential. Write with full details to—Box 2821.

TESTER of automatic electric control equipment required. Interesting work with good prospects. O.N.C. standard preferred. Five-day week, pension scheme, canteen facilities. Please write giving full details of age, previous experience, qualifications, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 277

TESTER required for transformers up to 5 kVA. O.N.C. preferred. Five-day week, superannuation scheme and insurance. Salary according to age and experience. Apply in writing to—London Transformer Products Ltd., L.T.P. Works, Cobbold Estate, Cobbold Road, Willesden, London, N.W.10. 2816

TRANSFORMER representative for the electronic and industrial transformer fields. Preference will be given to a person already engaged in a similar capacity. Salary plus commission. Car will be supplied.—Box 310.

WORKS engineer required for modern engineering works in Newcastle-Durham area to take charge of servicing and maintenance of the up-to-date electrical installation carrying a load of approximately 1,500 kW. The plant includes La Mont high-pressure hot water heating boilers and modern automatic high-precision metal turning and grinding machines used on mass production. Experience of A.C. and some D.C. essential. Reply stating age and full particulars of experience and salary required. —Box 2718.

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Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

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ELECT. eng. desires appointment with contractors. Preparation of schemes, estimating, supervision; from tender stage to completion (London area). —Box 9306.

ELECTRICAL engineer, just pensioned, wants employment. Last 18 years managerial post in heavy erection and commissioning.—Box 9303.

ELECTRICAL engineer (32), qualified, wide engineering background, some electronics, experienced in design, development and manufacture of medium static power supply equipments to commercial and government specifications, seeks change in locality, South or Midlands preferred. Preference for sales, technical, customer liaison or similar. Willing to travel, own car.—Box 9295.

ELECTRICAL/mechanical shipyard manager (English), now employed out East, open for Asian/African post in Oct., 1958.—Box 9294

EX London sales manager, M.I.E.E., national company, requires technical representation London; excellent trade connection.—Box 9296.

FARADAY House trained engineer, M.S.M.A. (aged 37). Background electrical contracting, marketing of sheet metal products to the electrical industry, viz., busbar systems, cable trunking, switchgear and control panels, lighting fittings. Experienced at selling at all levels, export, advertising, design, production, buying and general administration. Held present position as company manager for eight years; as company is transferring centre of operations to Midlands now seeking alternative employment in London area as sales manager or assistant.—Box 9301.

V 1 6 2 M R 2 1 5 8 UMI

ELECTRICIAN seeks job installing, wiring, erecting, mechanical-electrical machines; versatile experience. Reliable and conscientious; work on own initiative; travelling; good refs.—Box 9308.

ELECTRICIAN (supervisor) desires o/seas contract, A.C.-D.C. generation, transmission, hospitals, factories, lifts, etc. Extensive experience, including testing.—Box 9304.

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A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, secondhand and new up to 30 h.p. Starters, slide rails and pulleys. Ring Mon. 3355 for your requirements. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge. Brentford (EALing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, 110 and 220 v. D.C./230 v. A.C., .5 to 6kVA; also A.C./D.C. Special voltages at short notice.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL alternator set, 25 kVA, Paxman diesel type 4 RQ, B.T.H. alternator, 3-phase, 4-wire, 400/440 v.; checked, cleaned, painted; good running order. £350.—C.M.C. Engineers, Drakes Lane, Boreham, Chelmsford, Essex. 2759

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FIVE diesel generators for sale. McLaren/Brush, 4-cylinder, 1,000 r.p.m., capacity 69 kVA, 400/440 volt, 3-phase, 50 cycle, fitted with automatic cut-out for oil pressure failure. Open for inspection. Reasonable offer. Apply—Osborne Stevens & Co., Ltd., Sawmills, High Street, Uxbridge. 2854

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PREPAYMENT 1s. slot house service meters.—Universal Electrical, 217-221, City Road, London, E.C.1. 36

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QUARTERLY Credit Meters, single & polyphase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

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WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED, diesel engines and diesel sets.—H. Murfet, Daleside Rd., Nottingham. 240

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

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COMPANY MEETINGS

## THE ENGLISH ELECTRIC COMPANY

### Combating Inflation by Increased Efficiency

SIR GEORGE NELSON, Bt. (Chairman), presiding at the 39th Annual General Meeting held on 13th March in London, said the consolidated results for the year once again showed an improved position with the balance on trading account up by £765,000 to £1,233,840. After depreciation, loan interest and income from trade investments, the profit before taxation was higher by £181,000 at £6,916,989.

After taxation and after transferring taxation relief to reserve, the profit applicable to the company in the consolidated account was £2,951,285 compared with £2,911,812 a year ago; an increase of £40,000. The Board recommended a final dividend on the Ordinary stock of 10% less tax, making 14% for the year. Orders outstanding at the end of the year, for the Group as a whole, exceeded £250 million.

Turning to export, Sir George said he had mentioned last year that the company had received orders from 137 different countries. He could say again this year that orders had been obtained from just as many parts of the world. The very wide range of products covered by sales, from the large traditional electrical products at one end of the scale to small electric motors at the other, with aeroplanes to help swell turnover, had undoubtedly contributed to the successful year's working in the overseas territories.

Dealing with the problem of combating inflation by increased efficiency, the Chairman said that there was a determination that Britain must stop the inflation which had dominated its peace-time economy during the last twelve years. From time to time a warning had been issued that higher wages without an equivalent increase in output would price us out of the export markets. Happily, other factors had prevented this happening for the moment, such as improvements in design, improvements in production methods, and the increase in the volume of the company's business. Requests for higher wages where no equivalent increase in output or efficiency was possible must be restrained

Research remained one of the foremost activities of the Group. It had embarked upon the construction of greatly increased facilities at the Nelson Research Laboratories at Beacon Hill, near Stafford, and also at the Mechanical and Nuclear Laboratories at Whetstone, where scientists could concentrate still further on fundamental research.

#### Production Efficiency

Referring to production efficiency, Sir George said the company had made great efforts, but it must do even more. The results were not limited to the company, for electricity served the whole economy and many industries. The machines for modern power stations were, as a result of extensive research and development, progressively larger and more efficient than in earlier years. He took the opportunity to announce the recent receipt of an order from the Central Electricity Generating Board for two 275,000-kW turbo-generators for installation in their projected new Blyth "B" generating station. The design submitted by English Electric had been selected as the best on price, efficiency and technical excellence.

#### Review of Activities

The general review of the year's work—in previous years included in the Chairman's speech—was this year published separately in a brochure entitled "Activities 1957-1958."

The review states that the year 1957 showed substantial progress in the volume of both sales and production of the company's traditional products, which were again records.

In the field of atomic power the company, in association with Messrs. Babcock & Wilcox and Taylor Woodrow, received a contract last September for a station at Hinkley Point in Somerset, by far the largest atomic power station in the world.

The company has also been awarded an Admiralty contract for the design and manufacture of the steam propulsion machinery and the electric motors for the first British nuclear-powered submarine, H.M.S. Dreadnought.

The production of steam turbine generating plant for home and overseas again increased. Orders were received for two more 200-MW sets at High Marnham, making five English Electric sets of this size on order.

During the year the first three of six reversible pump turbines were commissioned at Niagara Falls for the Hydro-Electric Power Commission of Ontario.

The company also received orders for 105,000-h.p. water turbines for the first large pumped storage scheme in this country at Blaenau Ffestiniog in North Wales.

Substantial orders for more conventional water turbines and valves have been received from overseas, including Canada and America.

An important dollar order received in industrial diesels covered ten generating sets for Glen Canyon Dam on the Colorado River in Arizona.

English Electric has always played a leading part in the development of very large transformers, and has in manufacture transformers for the Snowy Mountains project in New South Wales and the Kariba Gorge Scheme in Rhodesia. The company supplied two 200-MVA transformers to the Tennessee Valley Authority, the largest units so far supplied from Britain for delivery in the United States of America.

The high-voltage airblast type of circuit breaker continues to be popular. One of the latest installations to be commissioned is for the super-grid at Rochdale, Lancashire.

The new range of indoor metalclad switchgear introduced during recent years has also been very well received.

The company was again very successful with the sales of motors and control gear.

One remarkable contract completed during the year covers the main electrical equipment for the 8-ft. high-speed wind tunnel at the Royal Aircraft Establishment, Bedford.

Orders received for rolling mill drives were again a record for both home and export.

The company continued to take a large share of orders placed for electric winder equipments for mines, both at home and overseas.

An order placed for a reversing rolling mill, using mercury arc rectifiers in place of motor generator sets, was a new departure in this field.

DEUCE computer deliveries included repeat orders from two customers. The company has installed three DEUCE computers in its own establishments, primarily for use with research and design problems. They are, however, also available to outside users on a time hire basis.

During the year there was a considerable extension of the company's domestic appliance activities. A much improved version of the well-known washing machines was introduced in the early spring, and during the autumn months production commenced of two new electric cookers incorporating many novel features.

To meet the public demand the company has put into production a new refrigerator combining both large capacity with small external dimensions.

The report and accounts were adopted. 2826


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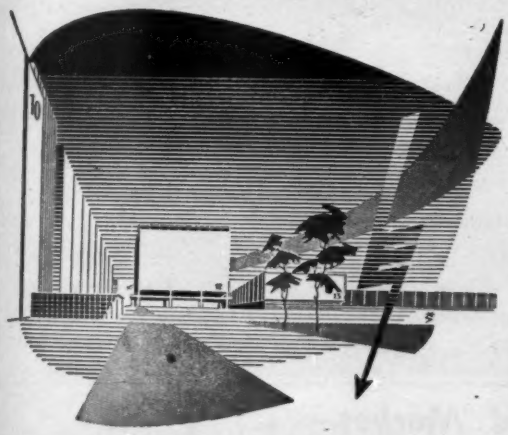

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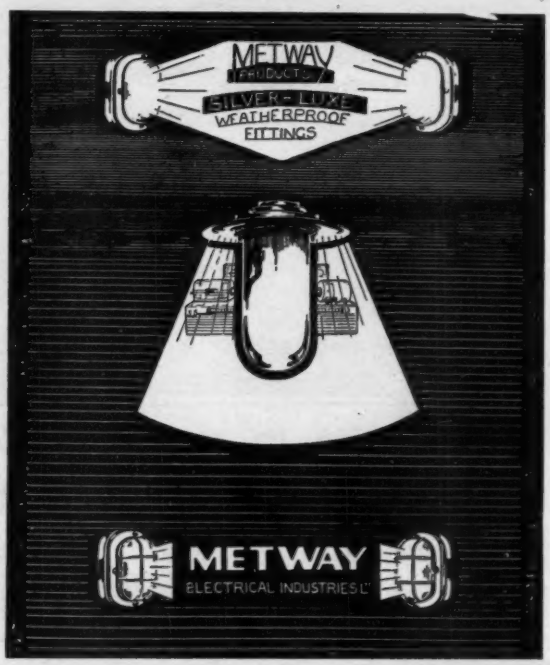


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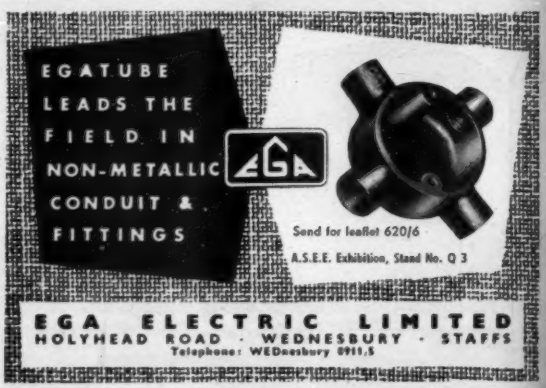


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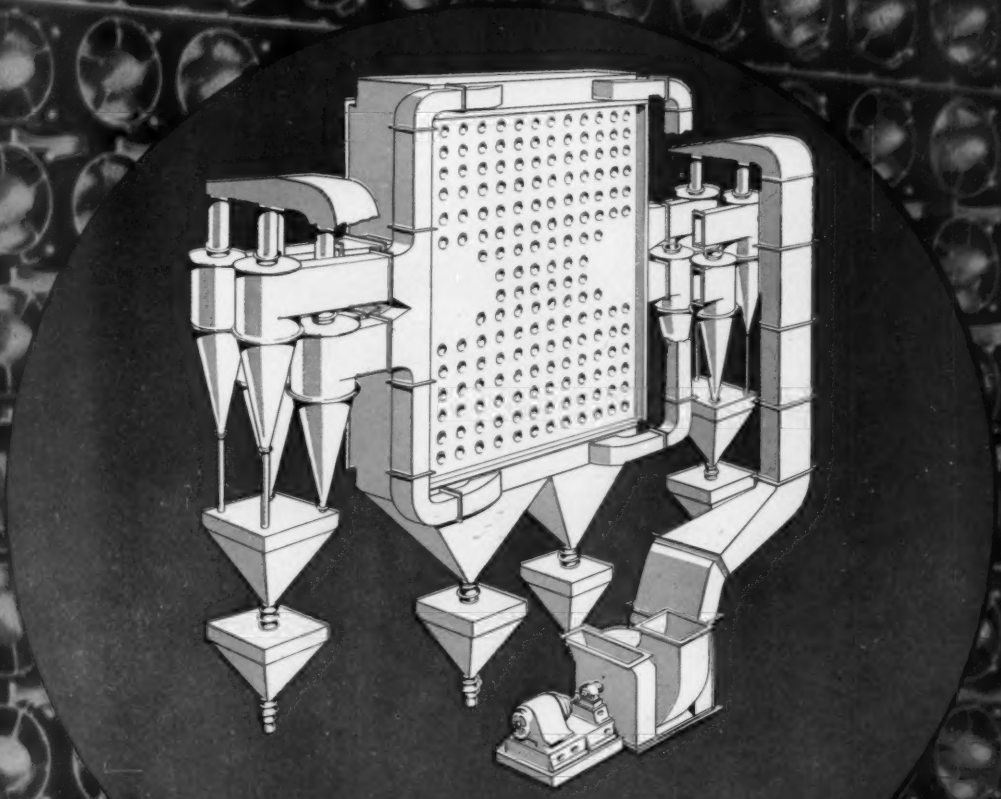

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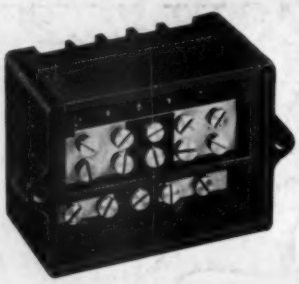

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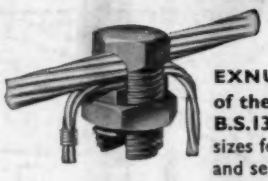

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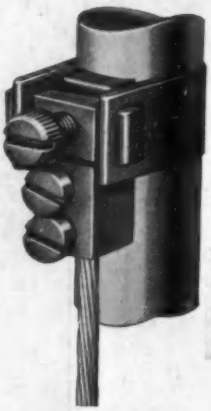

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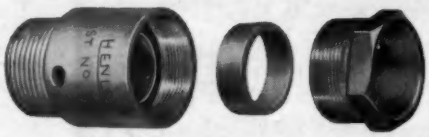

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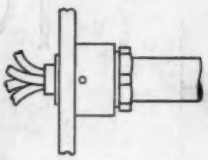

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